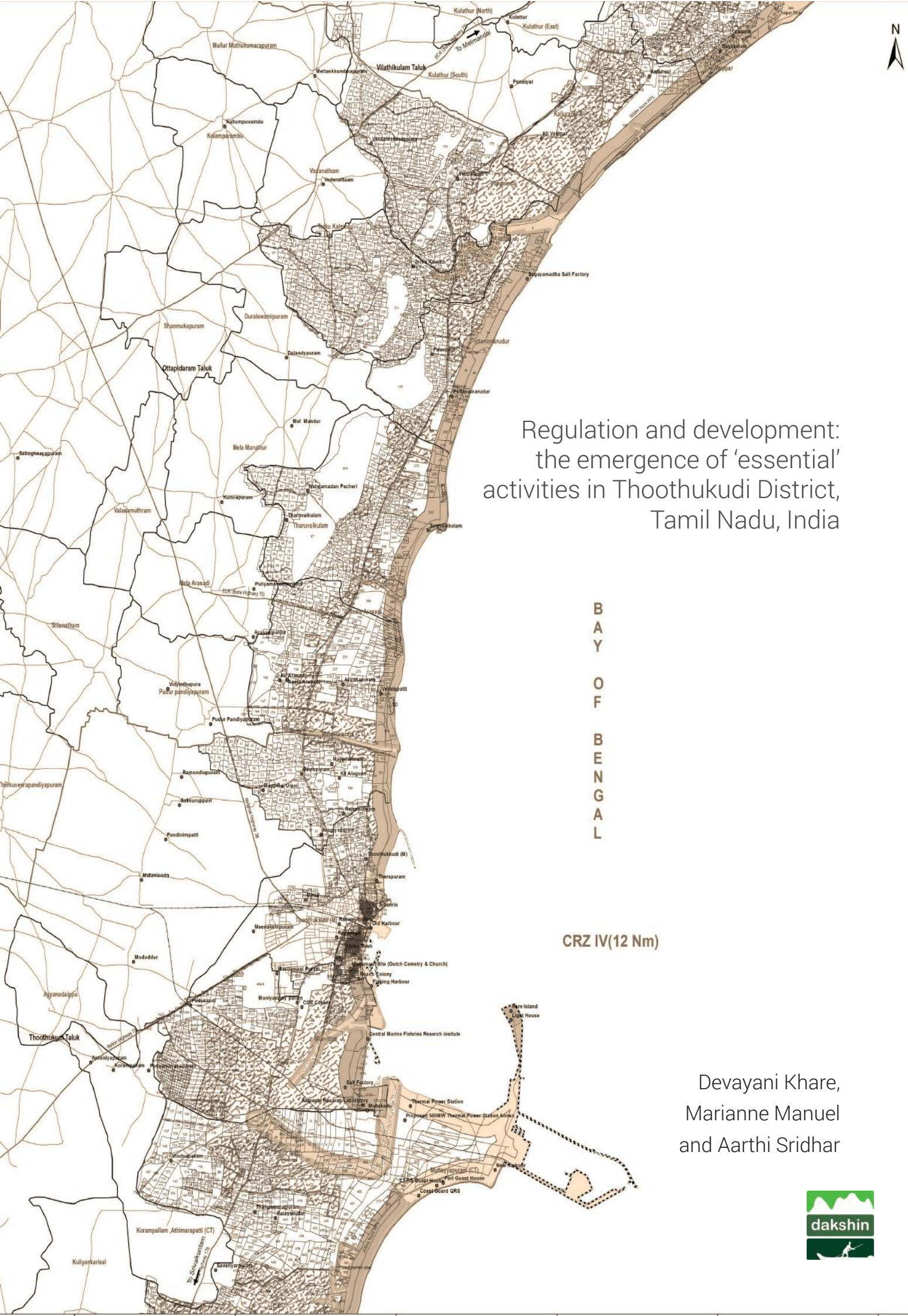

Regulation and development: the emergence of 'essential' activities in Thoothukudi District, Tamil Nadu, India

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dakshin

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Cover photo: Adapted from Thoothukudi District Map (Sheet No. 26) included in Coastal Zone Management Plan of Tamil Nadu

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Abbreviations

CEE	Centre for Environment Education
CMZ	Coastal Management Zone
CRZ	Coastal Regulation Zone
EIA	Environment Impact Assessment
EPA	Environment Protection Act
GIS	Geographic Information System
HTL	High Tide Line
ICZM	Integrated Coastal Zone Management
LTL	Low Tide Line
MSME	Micro, small and medium enterprises
NLC	Neyveli Lignite Corporation
VOC	V.O Chidambaram port
SPIC	Southern Petrochemical Industries Corporation
TAC	Tuticorin Alkali Chemicals

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Study context and research outline

The Indian coastline has been the site of multiple compelling narratives around trade, commerce and travel, evocative of idiosyncratic objects (silks, pearls, gems, spices and aromatics), state-subject relations and the circulation of global capital, knowledge, religion and philosophy.

The imperatives of maritime trade shaped the establishment of ports, port cities and fortifications around these military-economic centres. With the arrival of trading companies dependent on sea routes, like the Dutch East India Company and the East India Trading Company, coastal cities became the economic arteries of the country.

Five dominant drivers have marked the development of Indian coasts: industry, tourism, port activity, urbanisation and intensive agriculture or aquaculture (TERI 2002), all of which are evident in Thoothukudi district in Tamil Nadu in South India. We selected Thoothukudi district as the site of our pilot case study, hoping to follow the drivers of industrial development given that this was a site of maritime trade and economic linkages with the hinterland through its port, now one of India's 13 major ports.

The pre-Independence period of mid 1800s saw the first modern industries being set up along the coast; in 1854, the Bombay Spinning and Weaving Company was set up, followed by the Calcutta Jute Mill in 1855 (Chaloner, 1990). In Thoothukudi, the Madura Coats Cotton Mill was set up in the year 1877. During the post-Independence period, the Indian state followed a trajectory of development that has been described as capital intensive. Liberal development policies catalysed the coal industry, which then pioneered the iron and steel industry (Bansal 1984). In the public sector, expansion of the transport, communication and power networks was crucial. As the Indian power industry depends heavily on imported coal (ICC 2012), and is water-intensive, thermal power plants gravitated towards coastal locations (Dharmadhikary 2014). The coast soon became a hotspot for other import-export based industries like chemicals and minerals. With industries and trade ushering in urbanization, today, three of India's four metro cities, with the country's largest populations are located along the coast. By comparison, Thoothukudi has not emerged as a major metropolis, but the district remains an important industrial centre.

However, this form of industrial development has had severe consequences for coastal ecosystems comprising a diversity of habitats such as mangroves, swamps, tidal flats, beaches, sand dunes and coral reefs which in turn supports rich biodiversity. Such development has also been contested by a range of coastal communities whose livelihoods are based on these ecosystems. Several disasters[1] have also cautioned against certain forms of development in coastal areas. With the spectre of climate change induced sea level rise and associated weather events such as storms and cyclones awaiting us, it is believed that present day development activities and their regulation will be crucial in determining the future of coast-based economies and societies.

In this report, we juxtapose the development of industries along the Thoothukudi coast with the idea of regulating 'essential activities' for development under the rubric of the Coastal Regulation Zone notification (CRZ) under the Environment (Protection) Act, 1986.

This pilot attempts to address the following questions:

1) What changes have occurred in Thoothukudi's industrial development over the past three decades? What are the synergistic links between industries?
2) Has Thoothukudi's industrial development been significantly influenced by the regulations under the Coastal Regulation Zone notifications of 1991 and 2011?

Specifically, in this pilot study, we trace the emergence of industrial activity in Thoothukudi district of Tami Nadu and try to examine if there are correlations with the changing views on 'essential activities' permitted under the CRZ Notification. Finally, this paper outlines future areas for investigation to understand how industrial development in port areas has been shaped by the CRZ's changing list of permissible activities.

1 According to preliminary estimates the 2004 tsunami resulted in damages of $574 million and losses of $448.2 million (ADB et al 2005). Although the tsunami was entirely a 'natural' event, the effect of being transformed into a 'disaster', (damages and losses to lives and property and consequent tragedy) was on account of human presence and activity in the zone of its influence.

Methodology

In this study, both primary and secondary sources of data have been used. Primary data for the distribution of industries was collected from various sources such as the Pollution Control Board, Thoothukudi, from reports by the Ministry of Micro, Small and Medium Enterprises and data on coastal development collected by PondyCAN and Tata Institute of Social Sciences, and through interviews with government officials located in the district. The industrial data was then overlaid upon the Coastal Zone Management Plans of Tamil Nadu (sheet nos: 25, 26, 27, 28), published by the Department of Environment, GIS Cell, Government of Tamil Nadu, Chennai. Primary data for salt pan and allied industries distribution was collected from Google Maps, Wikimapia and the Salt Ministry, Thoothukudi. All graphs and maps have been charted from the available primary data onto the administrative boundary layers from DIVA-GIS. While Thoothukudi district is currently divided into 8 sub-districts (taluks), no administrative boundary shapefiles for the new sub-district of Ettayapuram exist, and older shapefiles consider it as a part of Vilathikulam taluk. The authors realise that the industrial data may not include a comprehensive list, yet all efforts to compile the same have been made (referred within the document as Compiled Industrial data: multiple sources). Secondary data was collected through interviews with government officials, industry representatives, NGO representatives, local environmental activists and fisher leaders from Thoothukudi.

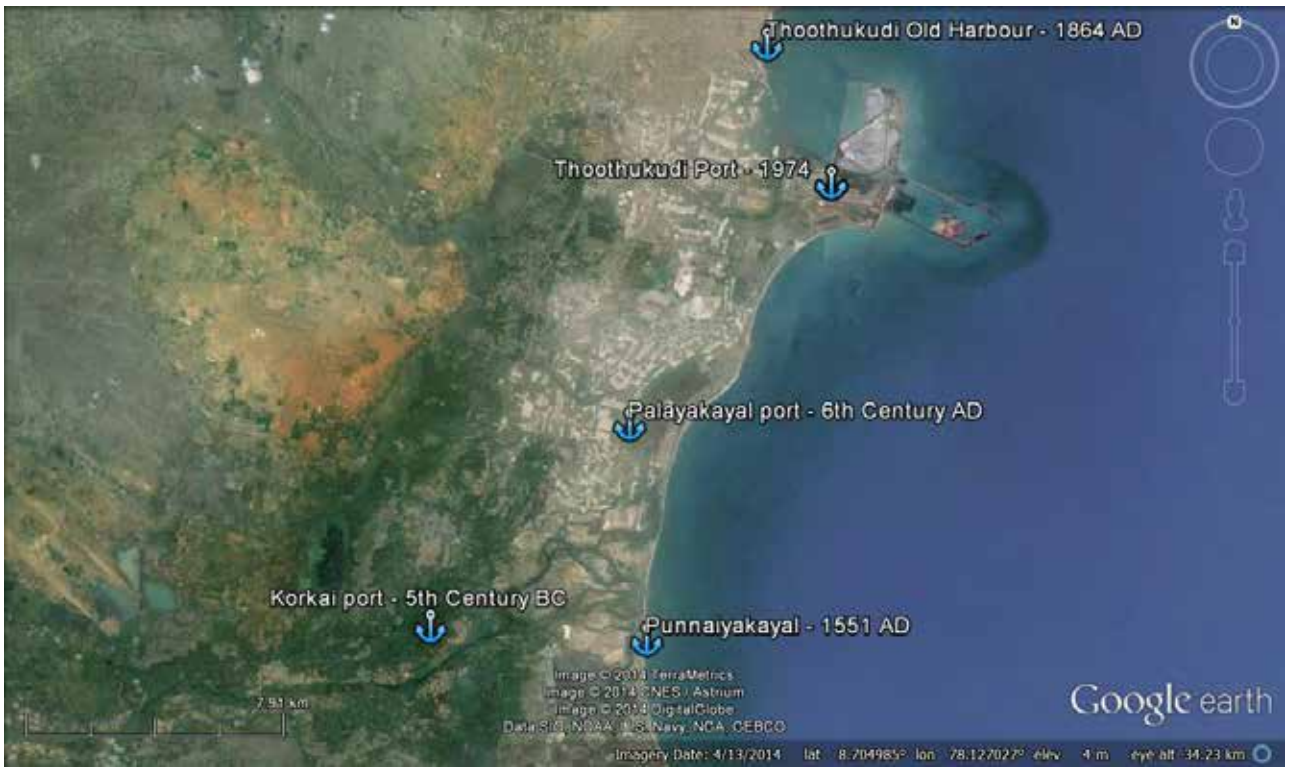

Fig 1: Historic ports in Thoothukudi district

Industries in Thoothukudi

Port

Historically, Thoothukudi district has had several ports that rose to significance over the years (refer: Historic ports in Thoothukudi district map above), and the present-day port was built upon this legacy of global trade. Chronologically, Korkai (8.63 N, 78.07 E) is the oldest port in Tamil Nadu, possibly as old as the first millennium BC but it emerged as a trade hub only in the 4th or 5th Century BC (Arunachalam 2006). During this period of the Pandyan regime, pearl and chank was the major source of revenue for local coastal communities and was a lucrative trade commodity worldwide. With the decline of Korkai, perhaps because of the shifting Tamiraparani river channel or the change of capital from Ten-Madurai or Korkai to present-day Madurai (Arunachalam 2006), Pazhayakayal (8.69 N, 78.12 E) became the major port in 1293 AD. This era saw the rise of the Mughal Empire and the arrival of Marco Polo in India. From 1498 to ca 1540, trade favoured the Punnaikayal port (8.63 N, 78.13 E), located to the south of Pazhayakayal (Flores 1995). This period was marked by the arrival of the Portuguese and the establishment of the first few Portuguese colonies in south India (Flores 1995)

With the arrival of the Dutch in 1658 AD, the Port of Colombo (6.95 N, 79.85 E) in Ceylon (present day Sri Lanka) became the trade hub, from where commodities from present-day ports like Thoothukudi, Rameshwaram, Sivakasi, and Travancore found their way into global markets; reducing Thoothukudi port's direct share of the global trade. The trade significance of Thoothukudi's port was further undermined during the British era, as they established their capital and developed the port in Madras.

This rich legacy of sea-based trade, led to the establishment of the Tuticorin harbour in 1864 AD. Exports included salt, cotton yarn, senna leaves, palmyra stalks, palmyra fibres, dry fish, while coal, cotton, copra, pulses and grains were imported (District Collectorate, n.d). However the relatively shallow depths of the harbour prevented larger cargo ships from entering, thus, limiting the nature and volume of trade. Despite improvements being made to the old harbour in the post-Independence period, it was deemed imperative to build a new port for the city.

On 11th July, 1974, the all-weather, V.O.Chidambaranar Port was opened. It was declared the 10th major port of India, and established direct cargo and container vessel connectivity to all major ports in the world like Colombo, Singapore, Mumbai, Mundra, Jebel Ali, Salalah, Rotterdam, Karachi, Hong Kong among others. Today, it facilitates both trade as well as industrial growth in the region by providing raw material for a number of industries.

The V.O.Chidambaranar Port has predominantly been a bulk import port catering to the industrial needs of power plants in the vicinity. While coal forms more than 40% of its cargo, imports include copper concentrate, raw materials for fertilisers such as rock phosphate, sulphur, phosphoric acid, liquid ammonia and fertilisers, timber logs, pulses, pulp wood, iron scrap, while exports range from cement, granite stone, sand and other construction material, food products like salt, tea, coffee, cashew, wheat and sugar among others. It also hosts a great deal of container traffic importing commodities like machinery, plywood, raw cotton, waste paper, iron scrap and wood logs, and exporting products of coir, chilly, dry flowers and garments (VOC 2014a).

The significance of a port as a commercial hub is well-established in economic studies today. Adam Smith propounded that coastal regions, with their potential to engage in sea-based trade have a wider market scope than interior regions, and that the industrial development along the coast then extends its benefits further inland (Mellinger 2000). India's coastal metros with their historic ports and trade bear witness to such a trend of development. Thoothukudi's development too has been driven by its sea-based trade, and its industrial prospects seemingly hinge upon the facilities offered by the port.

Salt Pans

In 1930, C. Rajagopalachari emulated Gandhi's Satyagraha March in Tamil Nadu, by walking from Tiruchirapalli to Vedaranyam (Swaminathan 2010), to achieve sovereignty for the state's salt industry. Thoothukudi's low rainfall and its clayey subsoil prone to salt water intrusion, has resulted in tracts of agricultural land, sand dunes, scrubs and mudflats being turned over for salt production (Gangai 2010).

As the second largest salt producer in the country, Tamil Nadu meets 26% of the country's salt requirements (Kasturi pers. comm. 2014). Thoothukudi has over 10000 acres of land under private and other ownerships, and around 1650 acres on lease for salt production (Kasturi pers. comm. 2014). As of 2012-2013, 2250 functional units existed in Thoothukudi,

employing over 1,50,000 people and generating an export revenue of Rs. 10.58 crore (MSME 2012 - 2013). In 2013-2014, the sector had 2652 organised and unorganised units (Kasturi pers. comm. 2014)

Salt finds several commercial uses; raw salt for industries, crystal salt, refined salt and iron-fortified salt for domestic uses. The raw salt undergoes a process of fractional crystallisation before finding use in fertiliser, detergent, textile dyeing, glass, building, water treatment and other chemical industries.

Synergy of industry: salt pans and allied chemical works

With a historic presence in the area, the salt pans have also benefitted and nurtured a host of other industries. The salt pans offer the fishing sector prospects for salt-fish processing. As salt production capitals have increased, some salt works have set up allied chemical industries within their premises. Large-scale salt-allied industries produce caustic soda (NaOH), soda ash ($NaCO_3$) which find uses in local chemical works such as Dhrangadhra Chemical Works Ltd, Southern Petrochemical Industries Corporation (SPIC) Ltd and until its closure in 2013, Tuticorin Alkali Chemicals (TAC). Smaller salt-allied industries such as Sahayamatha Salterns Pvt Ltd, Tuticorin Salt and Marine Chemicals Ltd, extract products like liquid bromide, bromine, magnesium sulphide, magnesium chloride, sodium bromide, potassium chloride, potassium fluoro siliciate, sodium fluoro silicate, Plaster of Paris, among others. It appears that industries that use these by-products have not yet emerged within Thoothukudi, and these products are instead sent to markets in other parts of the country and abroad. (Motha pers. comm. 2014)

Over the past two decades, salt pan areas in Thoothukudi have increased by 5.03% between 1993 – 2001, by 6.4% between 2001-2005, and in 2005, salt affected lands occupy 176.44ha of the total district area of 4621 sq.km (Gangai 2010), a trend that continues as per the Salt Ministry in Thoothukudi (Kasturi pers.comm. 2014). However, there are rising concerns about the detrimental impact of the saltwater intrusion on water quality in Thoothukudi, rendering it unfit for domestic consumption and agriculture (Chelladurai et al. 2004). Thoothukudi's salt industry continues to face several problems from rising production costs (Anon 2005) to drops in export (Narasimhan 2013). The Veppalodai area, the only significant salt producing centre in Thoothukudi district which finds mention in the Salt Ministry's annual reports, showed marked changes in land use patterns in 1920, when its agricultural area was converted into a major salt producing centre, and created a negative impact on its groundwater table (Gangai 2010). As the tables below indicate that while Veppalodai's yield is increasing, Thoothukudi's export quantities and values may be declining. However, this may not be a conclusive pattern as the available data is limited to just three years. Moreover, the source of the data below made no mention of whether the salt exported from the Tuticorin port was exclusively produced within the region or includes other sources.

Table 1: Year-wise annual salt yield in Thoothukudi

Average Yield (tonnes / acre)	2011-12	2012-13	2013-14
Veppalodai	54	60	66

Ref: Salt Ministry Annual Report, 2014

Table 2: Year-wise quantities and values for salt export from Thoothukudi Port

Salt Export	2011-12	2011-12	2012-13	2012-13	2013-14	2013-14
	Quantity ('000 tonnes)	Value (Lakh Rs)	Quantity ('000 tonnes)	Value (Lakh Rs)	Quantity ('000 tonnes)	Value (Lakh Rs)
Tuticorin port	154.51	3942.42	160.57	3082.86	135.54	3141.05

Ref: Salt Ministry Annual Report, 2014

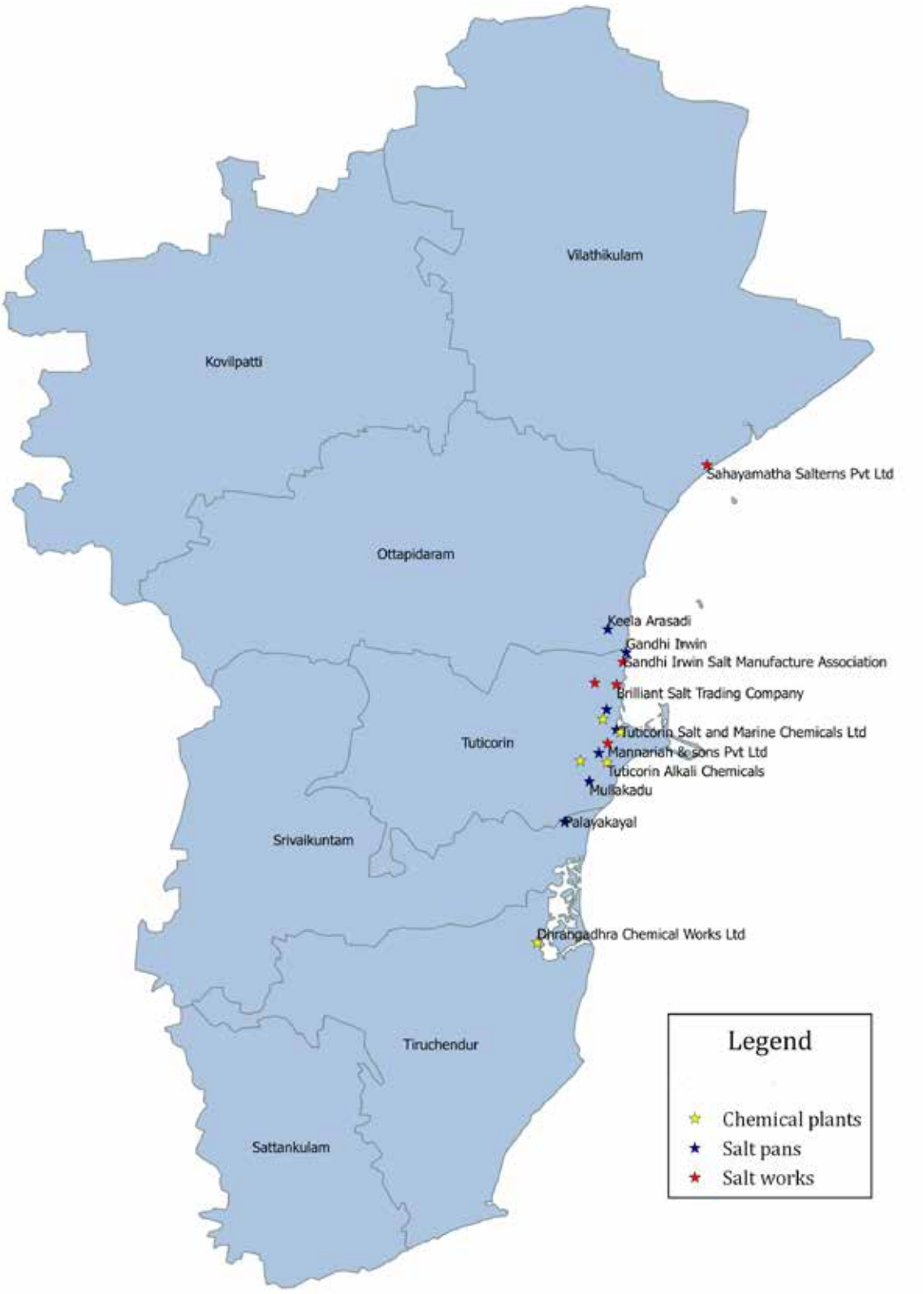

Fig 2: Distribution of salt pans and allied industries along the coast of Thoothukudi district
Sources: Google maps, Wikimapia, Salt Ministry, Thoothukudi, DIVA-GIS

Synergy of industries: port and import-export / power-based industries

As one of India's 13 major ports, Thoothukudi's port has played a vital role in shaping and sustaining the industrial growth along the eastern coast. At the end of 1970, Thoothukudi's industry included salt, textiles, chemicals and fertilisers. After the establishment of the port in 1979, more industries emerged in Thoothukudi district, and it was widely believed to be a catalyst of development (Anon, 2012). While far more data is required to conclusively attribute the present industrial growth to the port, a marked change in economy is evident from the trends thus far. As the maps below indicate, after 1979 there was an increase in the number of industries established in Thoothukudi. Moreover, the trend indicates fewer resource-based industries like textile, salt, frozen foods, among others and more import-export based industries like fertiliser, chemical works and power plants being established along the coast. Thoothukudi's industrial vision for the next few decades projects growth in sectors like logistics, heavy engineering and mineral ores, all of which will be dependent on the port (Madras Consultancy Group 2008).

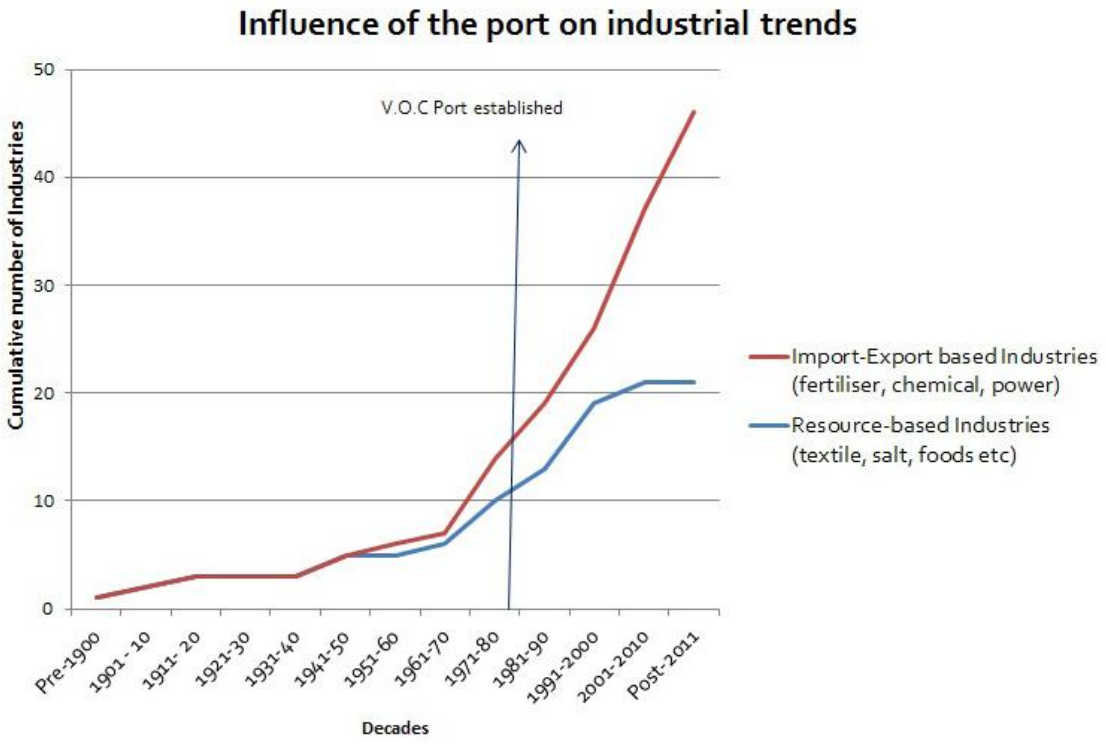

Fig 3: Influence of the port on industrial trends
Source: Compiled Industrial data: multiple sources

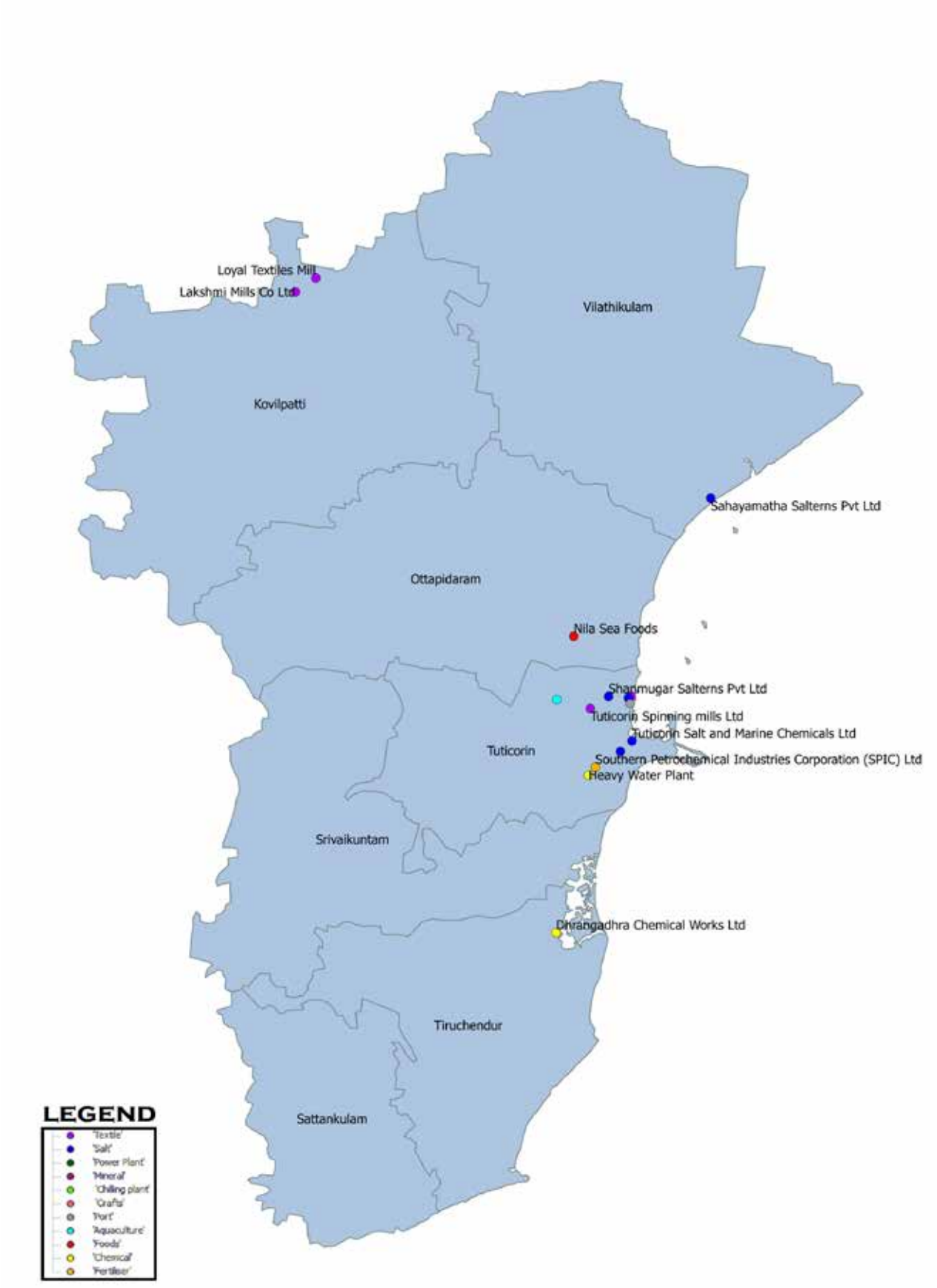

Fig 4: Industries established before the port, pre - 1979
Compiled Industrial data: multiple sources

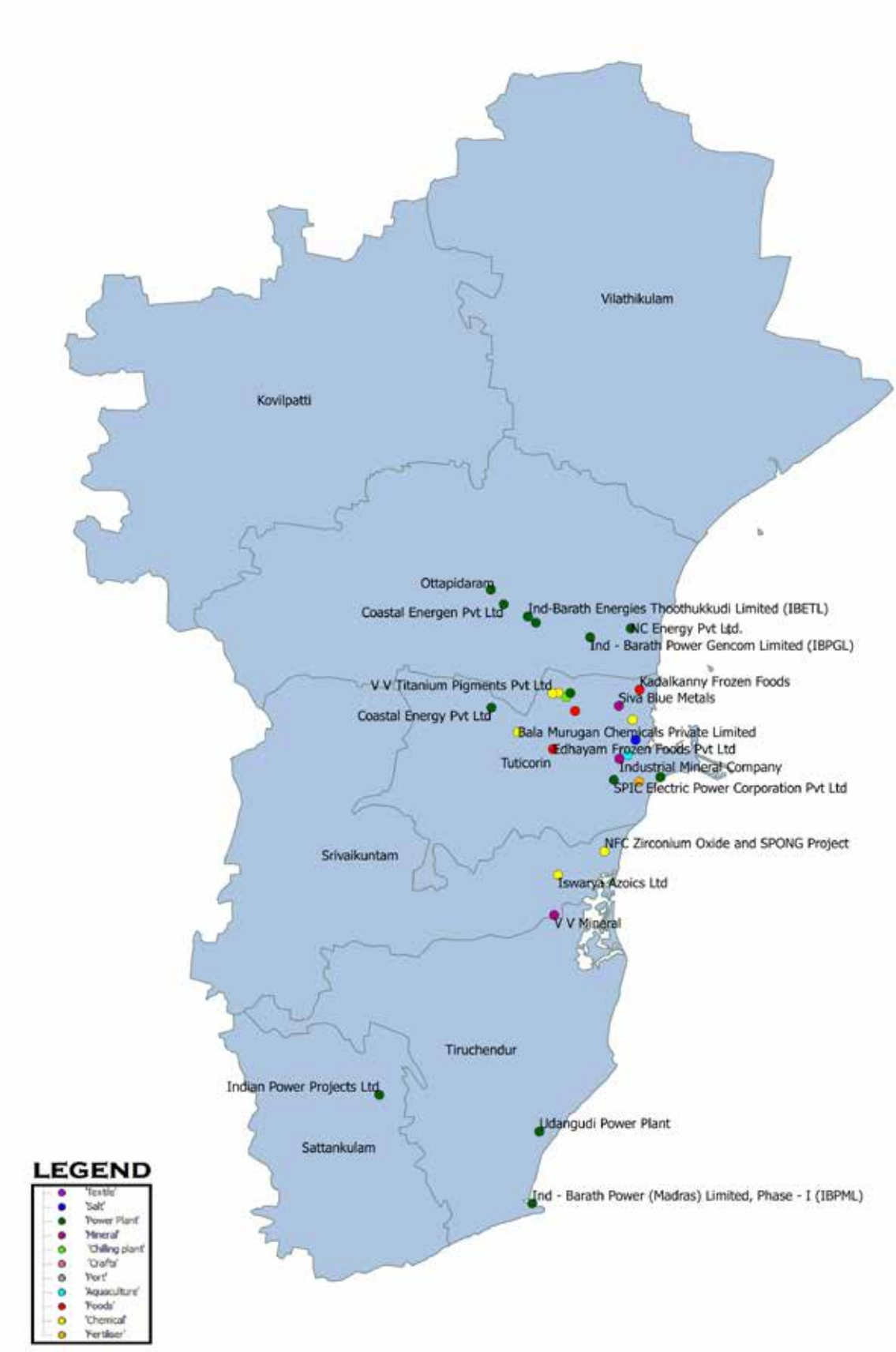

Fig 5: Industries established after the port, post - 1979
Compiled Industrial data: multiple sources

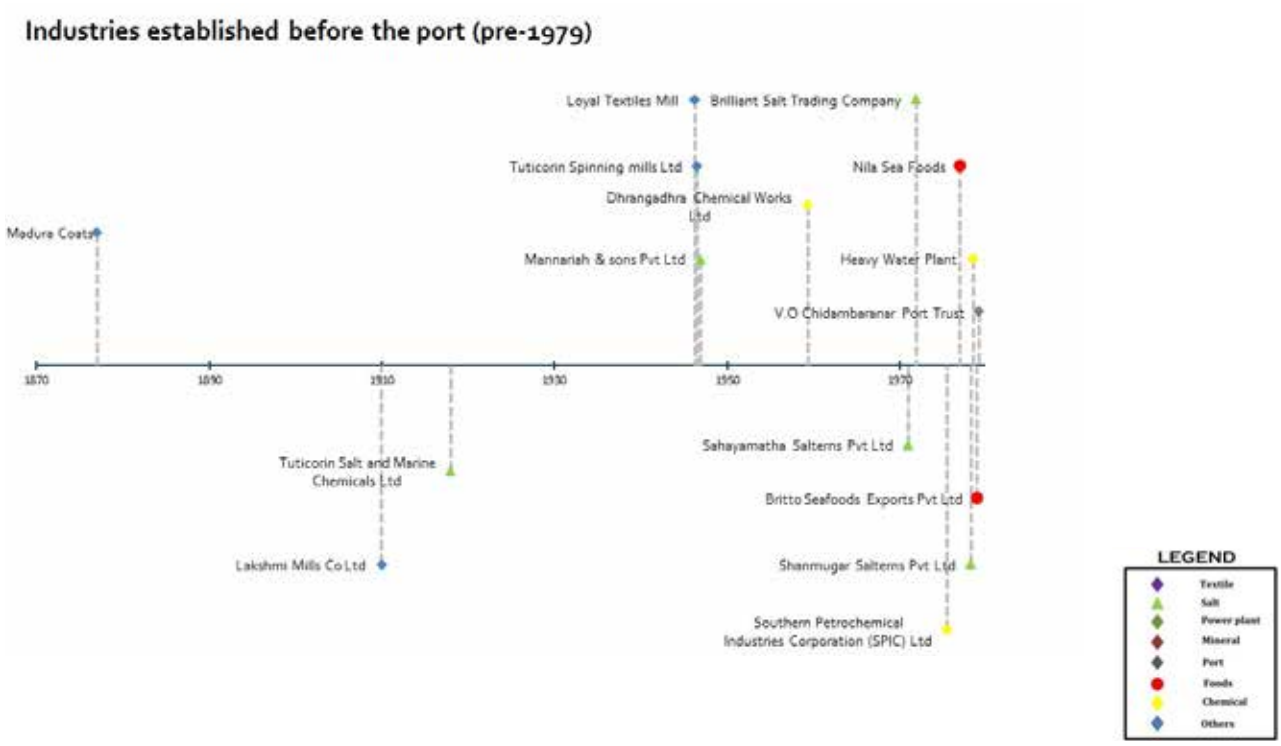

Fig 6: Time line of industries established before the port (pre-1979)
Compiled Industrial data: multiple sources

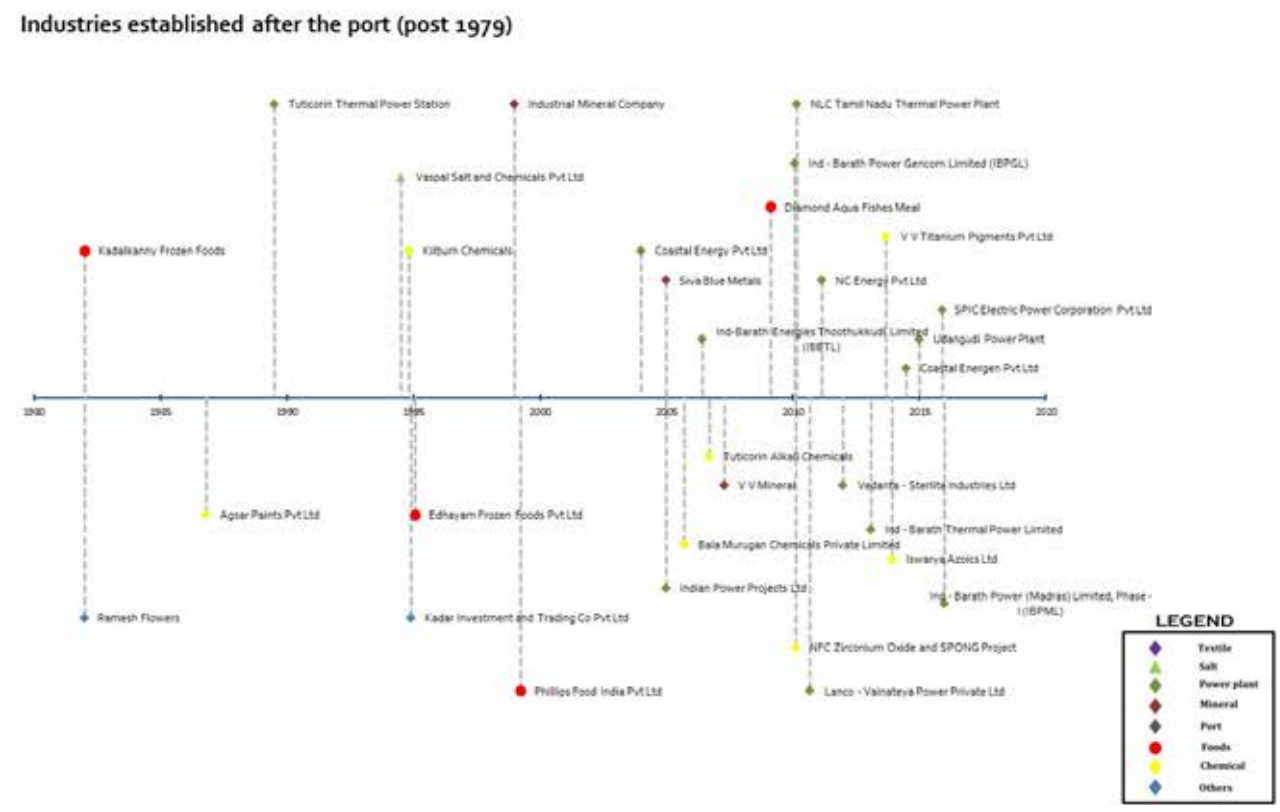

Fig 7: Time line of industries established after the port (post-1979)
Compiled Industrial data: multiple sources

Laws and their impact on development

The laws enacted in the colonial period of the British Raj were concerned largely with colonial control over specific natural resources and their trade. With little industrial development at the time, the environmental laws mainly applied to large cities and their impact on local water bodies and the sea such as the Indian Penal Code of 1860, which contains sections regarding water and air pollution and the Shore Nuisance (Bombay – Kalova) Act to check wastes and marine water pollution (Shankar 1998) The post-Independence period has seen the emergence of several central legislations such as the Wildlife (Protection) Act, 1972, the Forest (Conservation) Act, 1980, the Environment (Protection) Act, 1986. However, against the drive for industrialisation and economic growth, conservation has been pitted against a practice of development with environmental laws often failing to address their original objectives. This section looks at one of the more controversial environmental laws in recent years, the Coastal Regulation Zone notification (CRZ) 1991 and of 2011, its interpretations and how it has influenced industrial development in Thoothukudi. Here, we attempt to chart the emergence of industries in juxtaposition with important milestones in the CRZ Notification.

CRZ Notification

The Coastal Regulation Zone notification (hereafter CRZ) issued under the umbrella legislation – the Environment (Protection) Act, 1986 is arguably one of the most contentious environmental laws. First drafted in 1991, amended 25 times since, and re-introduced in 2011 as a fresh notification replacing the earlier law, the CRZ is still being debated over, and its implementation impeded. As the name suggests, it set down regulations for various anthropogenic activities along India's coast to safeguard coastal habitats, intertidal zones, estuarine niches and traditional livelihoods.

The CRZ law saw a number of changes since its promulgation. In February 2005, the Swaminathan Committee Report (henceforth referred to as the Swaminathan Report) reviewed the CRZ notification and advocated change from coastal regulation to coastal management, which environmental activists including fisher organisations protested as a means to sell out coasts to industrial interests. In July 2008, the MoEF issued a draft Coastal Management Zone (CMZ) notification and invited public suggestions and objections, where this was protested vehemently. A second committee, once again chaired by Prof. M.S. Swaminathan, reviewed the public concerns in a report titled "Final Frontier," (henceforth referred to as the Final Frontier) which recommended that the draft CMZ notification be allowed to lapse and the CRZ notification 1991 be strengthened. Public pressure ensured that in 2009, the Centre for Environment Education (CEE) was commissioned to hold a series of public consultations (henceforth referred to as the CEE consultations) to garner suggestions on the CRZ 1991.

In 2011, a new Coastal Regulation Zone notification was issued by the MoEF. The CRZ 2011 divides coastal areas into 4 zones based on their fragility and existing development, namely: CRZ-I consisting of ecologically sensitive and important areas, CRZ-II with areas which are already developed up to or close to the shore-line, CRZ-III includes areas that are relatively undisturbed and those which do not belong to either CRZ-I or II and CRZ-IV which comprises the area from the Low Tide Line up till 12 nautical miles into the sea.

The CRZ notification in the context of Thoothukudi

In Thoothukudi, the total extent of land falling within the CRZ covers 5361.43 hectares, with 2990.65 hectares falling under CRZ I, 504.85 hectares within CRZ II and 1865.93 hectares within CRZ III. Comprising 55.78 % of the CRZ area, the CRZ I encompasses the estuarine and salt pan stretches of Thoothukudi's coastline. The CRZ II's 9.42% includes the well developed areas of Tuticorin, Kayalpattinam, the V.O.C Port and some industrial hubs. The CRZ III, characteristic of rural areas, occupies 34.8 % of the total coastal stretch (Gangai 2010).

The CRZ notification classifies a set of activities as 'essential' activities. Below, we've outlined the concerns that have emerged with a number of these essential activities.

Sand mining

In recent years, the issue of illegal sand mining in Thoothukudi has come under the media scanner (Chaturvedi 2013). The District Collector (Koshy 2012) and the Supreme Court (TNN 2013) are both trying to address the issue. The 1991 notification (Sec. 2. ix) prohibited the mining of sand except for those rare minerals not available outside the CRZ areas, a clause that lacked a definition for rare minerals and failed to mention limits for extraction. An amendment on

12th April 2001 (SO 329 (E)) diluted the 1991 provision to also permit mining of sand, rocks, and other substrate materials for oil and natural gas explorations. The Swaminathan Report recommended strengthening this by enforcing 'ecological mining principles', and the CEE Public Consultations also expressed the need to prohibit sand mining altogether. Despite these concerns, the V.V Minerals industry was established in 1989 and has been a major exporter of ilmenite sand and garnet since. Today, the company is facing charges for illegal mining on government land to the tune of over Rs. 96,000 crores, with several governmental departments being implicated as well (Kandavel et al. 2013).

Thermal power plants

Only nuclear power plants are considered as part of power generation within the CRZ notification. Foreshore facilities for transport of raw materials, facilities for intake of cooling water and outfall, and discharge of treated waste water were permitted for the power sector in the 1991 regulation, and subsequently, more power projects over the past decade have emerged along Thoothukudi's coast (refer: figure below). Despite prohibitions for setting up thermal power units, it is not clear on what grounds the NLC Tamil Nadu Thermal Power Plant (8.74 N, 78.17 E) established in 2010 within the CRZ I area and the Ind - Barath Power (Madras) Limited, Phase – I (8.38 N, 78.06 E) proposed for 2016 within the CRZ III area (refer: maps below) are permitted. With Thoothukudi emerging as a power hub for Tamil Nadu, with several power plants under construction and expansion, the provisions of the CRZ with respect to thermal power plants will become important.

In October 2002, an amendment to the CRZ permitted nuclear power generation facilities in areas not classified under the CRZ I (i), and as of date one plant - the Udangudi nuclear power project (8.440154 N, 78.06359 E) was permitted after an MoEF clearance on Oct 14th 2013 (MoEF 2013), in the study area. We can however see the influence of the CRZ notifications in the growth of the non-conventional energy sector. In 1991, the non-conventional power sector was not part of the notification, an inclusion suggested by the Swaminathan report and the CEE public consultations. At present, the CRZ notification permits non-conventional energy generation projects within CRZ II and III areas, provided they obtain EIA clearances from the MoEF. A few non-conventional plants have been set-up in Thoothukudi district by proponents who previously only had stakes in conventional energy, for example by Coastal Energy Pvt. Ltd established a biogas plant in 2004 (8.80 N, 78.02 E) and Ind-Barath Energies Thoothukudi Limited set up a biogas plant in 2006 (8.88 N, 78.05 E), though neither falls within the CRZ area.

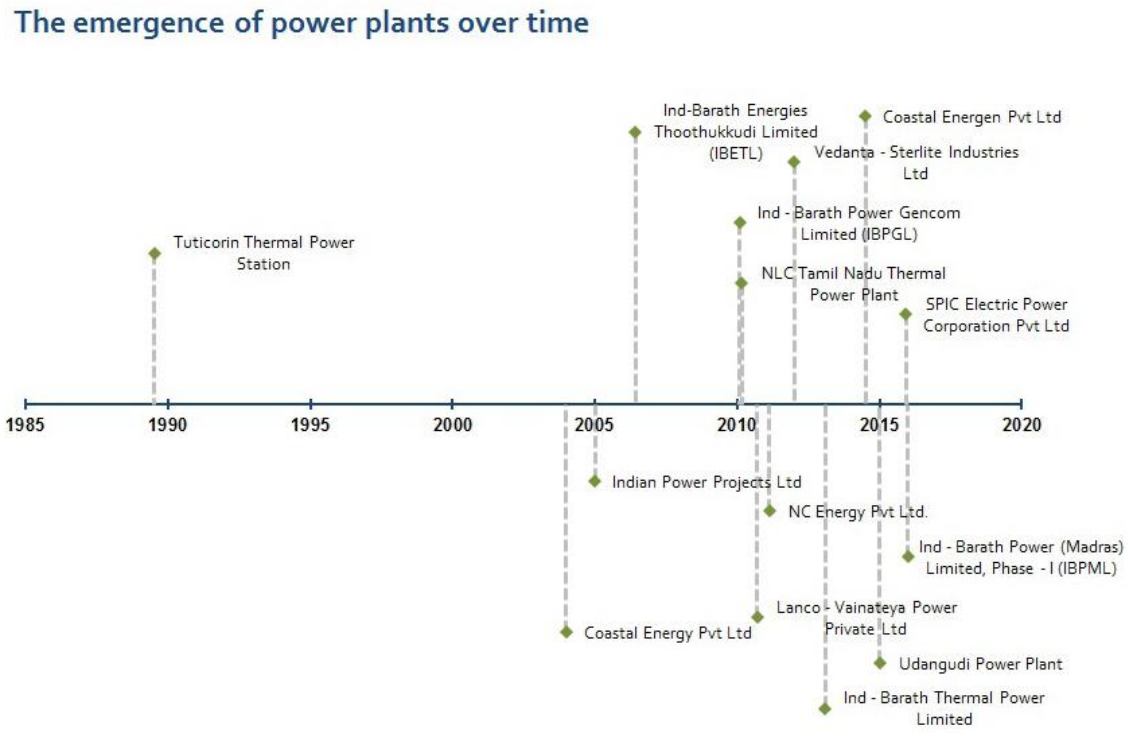

Fig 8: The emergence of power plants over time
Compiled Industrial data: multiple sources

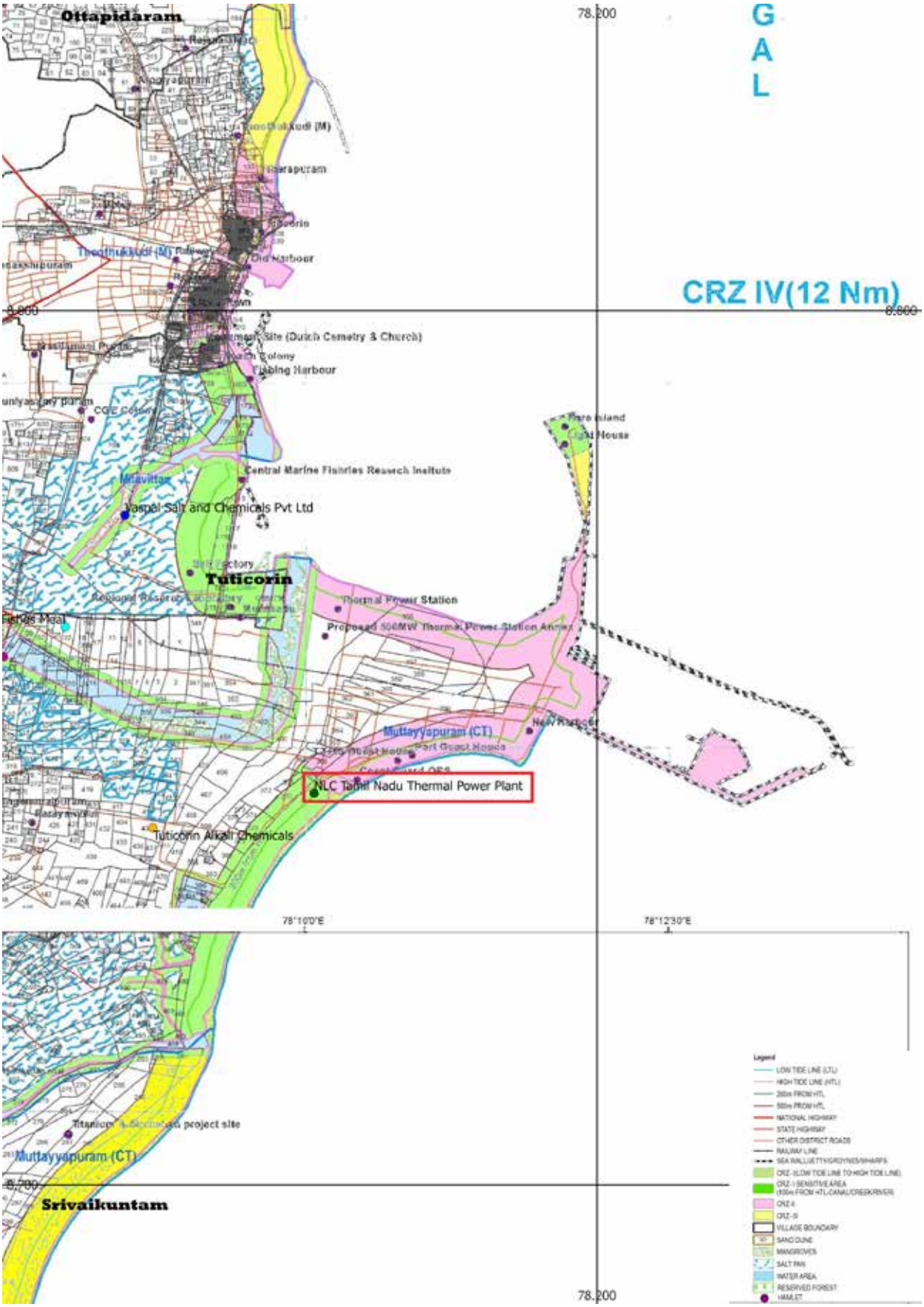

Fig 9: Location of industry with regard to the Coastal Zone Management Plan of Tamil Nadu
Source: overlay of mapsheets 25, 26, 27, 28 from the Coastal Zone Management Plan of Tamil Nadu, Department of Environment, GIS Cell, Govt. of Tamil Nadu, Chennai

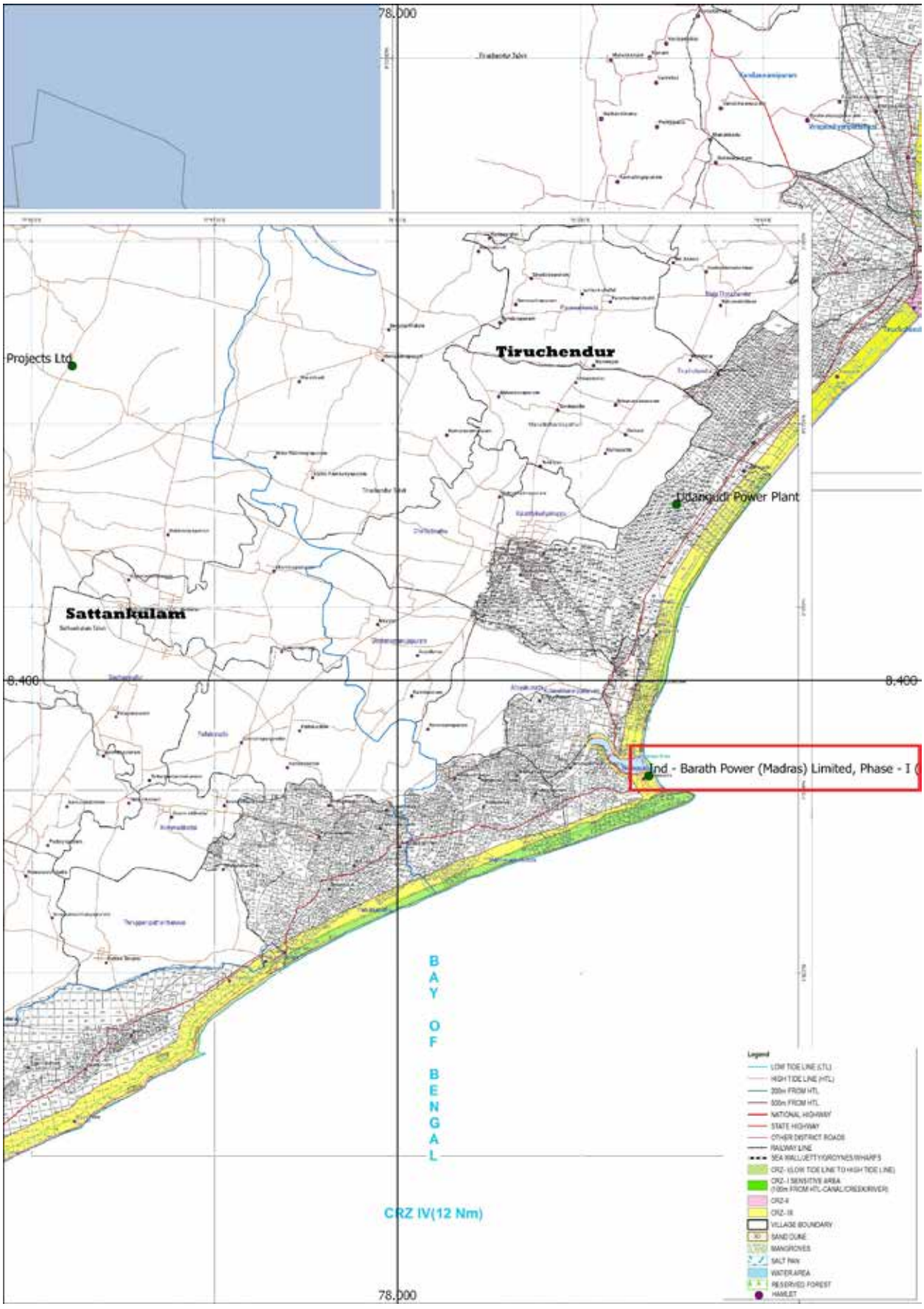

Fig 10: Location of industry with regard to the Coastal Zone Management Plan of Tamil Nadu
Source: overlay of mapsheets 25, 26, 27, 28 from the Coastal Zone Management Plan of Tamil Nadu, Department of Environment, GIS Cell, Govt. of Tamil Nadu, Chennai

Groundwater

The CRZ notifications contain provisions pertaining to groundwater withdrawal, a significant inclusion to regulate domestic and industrial water usage. Under the 1991 notification, restrictions on groundwater withdrawal from CRZ III areas were laid down, with recommendations from the Swaminathan Committee to consider groundwater as a social resource, limit exploitation, prioritise drinking water needs, protect and regulate salt water intrusion and ingression into aquifers. In the case of Thoothukudi, the recent industrial growth and resulting pollution of the shallow groundwater resources is a rising concern (Mondal 2008). This is becoming a pressing issue especially since coastal areas are more prone to microbial contamination due to the mixing of industrial and domestic sewage (Selvam 2014). In recent years, the conflicts between industrial and domestic needs in Thoothukudi have risen, with liberal industrial water allocation causing severe urban shortages (Anon 2012). While the 2011 CRZ notification has provisions that allow for groundwater extraction only 200 metres from the high tide line by manual means, it fails to provide preventive or ameliorative measures for groundwater usage in areas just outside its jurisdiction as well as saltwater intrusion into areas within its jurisdiction. The Coastal Zone Management Plans absolutely do not address these issues despite there being provisions to make such interventions.

Port-related activities

The expansion of a port, was allowed under the 1991 notification, a provision criticised by several civil society groups and also finding mention in the Swaminathan Report which underlined the environmental concerns of dredging. Maintenance and capital dredging form an important component of all port expansion plans including those of the current expansion plans for Thoothukudi's V.O.C port (VOC 2014b). Yet it has been largely ignored by the CRZ 2011, which provides a blanket approval for port and harbour projects, even in high eroding stretches of the coast if defined as 'strategic or defense related'. The fertiliser, chemical, mining and power industries have flourished along this coast due to the presence of the port, an essential facility that has fewer restrictions on clauses regarding hazardous wastes, defence constructions and land reclamation. Civil society groups such as the National Campaign for the Protection of Coasts have demanded a moratorium on the expansion of ports citing problems with shoreline erosion. It is also necessary to conduct cumulative impact studies on port-reliant coastal industries in order to plan a set of demands in relation to port siting and management. The approaches to port development need to consider the influences of port development on a range of other activities with social and environmental impacts such as shipping, storage of material, inland transportation and so on.

Land reclamation and erosion control measures

The 1991 notification disallowed land reclamation, bunding and obstruction of natural sea water channels, except for the control of coastal erosion, the maintenance or clearing of waterways, channels and ports, the prevention of sandbar formation, stormwater drains, the prevention of salinity increase and sweet water recharge. Despite these inclusions, it failed to address the problem holistically. The provision has been interpreted as simply permitting sea walls in the CRZ. However, erosion measures, either hard or soft need be introduced in relation to the idea of coastal vulnerability, the cumulative impacts of similar interventions elsewhere and overall anthropogenic activity along these stretches. During the 2004 tsunami, Thoothukudi had low mortality and damage yet with large stretches between Thoothukudi and Sirkazhi being highly vulnerable (Bhalla 2008) and host to an increasing fisher and urban population and port-driven industrial activities protection against impacts of future disasters cannot be discussed merely in terms of erosion control structures.

Fisher rights

The CRZ seems to view fishers as lawful coastal inhabitants, with both versions of the notification permitting the construction of dwelling units within the demarcated zones. The CRZ 2011, urged by widespread concerns, also stipulates that coastal tracts allocated for fishers' dwellings should not be used for commercial purposes, nor be sold or transferred to other communities. While this step identifies the right of the fishers over coastal land, a lack of documentary evidence of ownership would complicate the classification of legal and illegal dwellings. Furthermore, both notifications take a firm stand on allied fishing activities, and prohibit the setting up and expansion of fish processing units and warehousing. The Swaminathan Report, CEE public consultations and the Final Frontier report raised concerns about the fishers requiring the foreshore for fish-drying, net-mending, and post-harvest facilities for perishable commodities, while safeguarding the land from non-fishery activities. As a compromise, the 2011 provisions allow all fishing-allied activities within the CRZ III. Other traditional rights especially regarding their stake in coastal management have by and large been ignored by the CRZ 1991 and 2011, with the latter conceding

to necessary facilities of schools, toilets etc in CRZ I, II and III areas and unrestricted traditional fishing and allied activities in the CRZ IV.

Sewage and urban waste management

With respect to waste management, the CRZ 1991 was emphatic in disallowing untreated waste disposal and discharge from settlements and industries, with stipulations for existing practices to be phased out within 3 years of the notification. The CRZ 2011 recapitulates the waste disposal regulations; it permits units for the treatment of wastes and effluents arising from hotels, beach resorts and human settlements located in CRZ areas other than CRZ-I, and the disposal of such treated waste. Along with terms for phasing out existing practices of releasing untreated sewage, and a comprehensive, public participatory sewage treatment plan, it also recommends that pollution from oil, gas and shipping activities must be regulated. However in Thoothukudi, increasing concerns are being raised about the fish-stock dwindling due to untreated industrial effluents released into the sea (Asha 2013), and the health impacts on the fisherfolk. Old planning maps for the port, demarcate offshore areas near thermal power plants for fly ash dumping, a practice that still continues. The CRZ 2011 had stipulated a two year period for phasing out existing practices for the discharge of untreated effluent and sewage, a one year period for phasing out ash dumping and industrial solid wastes, both of which have lapsed. Moreover, it demanded the formulation and implementation of a comprehensive plan for the treatment of sewage generated by coastal towns and cities within a period of one year in consultation with stakeholders including traditional coastal communities and fishers, which also has not been obeyed. Any implementation of these waste management clauses under the CRZ will have to address these obstacles.

Storage of Hazardous waste

S.O 1100 (E) dated 19th October, 2002, overruled the prohibition of the manufacture, handling, and storage of hazardous substances laid down by the CRZ 1991, to include its transfer via ports, and furthermore allowed facilities for receipt and storage of fertilizers and raw materials required for its manufacture, within areas not classified as CRZ-I(i). This amendment was retained in the CRZ 2011. This move has been rather beneficial for the V.O.C port in Thoothukudi, whose cargo includes LPG, hazardous fertiliser raw materials such as ammonia (Class C, Schedule II, Hazardous Wastes Rules, 2008).

Table 3: Other laws that govern Thoothukudi's industries

Name and year of Act	Stipulations	Sector applicable to
Indian Fisheries Act, 1897	Prohibited the use of dynamite and explosives for fishing	Fishery
Wildlife Protection Act, 1972	Species-specific fishing guidelines	Fishery
Marine Fishing Regulation Act, 1978 Tamil Nadu Marine Fishing Regulation Act, 1993	Regulated fishing in the territorial waters: prohibition on certain fishing gear, regulation on mesh size, declaration of closed season, demarcation of no trawling -zones, as also the use of turtle excluder devices and designation of no fishing areas Defined the daily fishing schedule, imposed a single-day fishing order and allowed mechanised fishing only beyond 3 nautical miles for resource conservation, dictated penalties and exemptions	Fishery
Central Excises and Salt Act, 1944	Consolidated, amended and repealed all former laws relating to central duties of excise	Salt
Industrial (Development and Regulation) Act, 1951	First industrial law, for regulation and development	Industry
Companies Act, 1956	Defined the setting up, financing, operation, closure of companies	Industry
National Industrial Policy, 1991	Deregularised the industrial sector, cut down the administrative interference in its operation, and allowed free competition between market forces	Industry
Electricity Act of 1910 and 1938, amended in 1998	Enabled private investment in the power sector	Industry (power)
National Textile Policy, 2000	Rejuvenated the textile industry	Industry (textile)

Impacts on industrial development

Over the years, Thoothukudi's industries have witnessed several trends of peaking, stagnation and decline, and tracing these patterns could help indicate the efficacy of legal regulations. With Thoothukudi's coastal location, the Coastal Regulation Zone notification of 1991 and 2011 were central to regulating industrial development along the narrow 500 metre stretch of the coast. However, we see the emergence of a number of industries in the vicinity of the CRZ region and in many instances, the CRZ itself does not prevent industrial development in areas close to Thoothukudi town. Thus the CRZ notification itself has not been a major deterrent to industrial development. Rather industry sources and government officials that we spoke to cited other reasons for the growth or stagnation of industrial development.

Before 1991, the large-scale coastal industries in Thoothukudi were diverse, mostly salt, textile and chemical plants, with some food, fertiliser and aquaculture units and one power plant. The salt, food and aquaculture industries were natural resource-driven, whereas the textile, chemical and fertiliser units relied upon imports. The 1970s were marked by rapid industrial development. The most significant development before the CRZ notification was the port in 1979, which some say, catalysed other industries in the subsequent decades (The Hindu, 2012).

After the 1991 notification, regulations were laid down for different kinds of development along the coast, and the industries seem to have emerged further inland, with some noticeable infringements by the mineral works and one power plant. This period saw an increase in the power sector, with some chemical, fertiliser, food and aquaculture units. After 2011, the power and chemical sector continued to boom closer to the coastline, with little heed to the redrafted CRZ notification, and several more plants are expected in the near future. However, the number and diversity of industry over the past few years has declined.

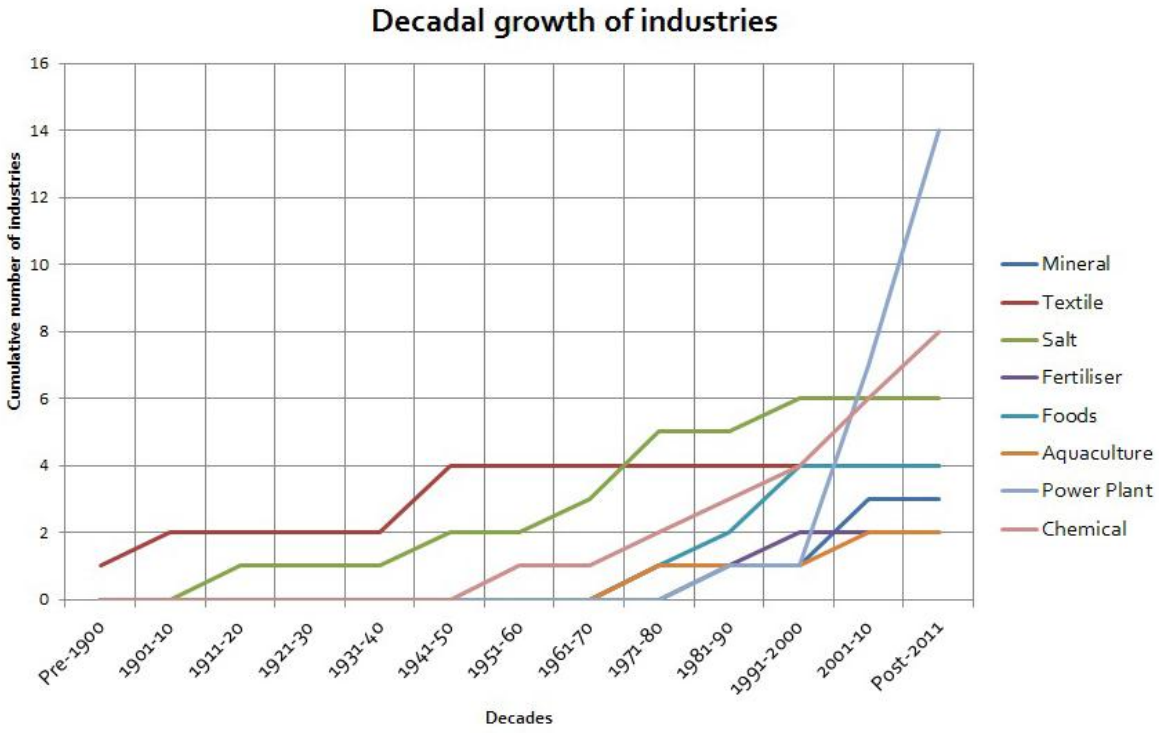

Fig 11: Decadal growth of industries
Compiled Industrial data: multiple sources

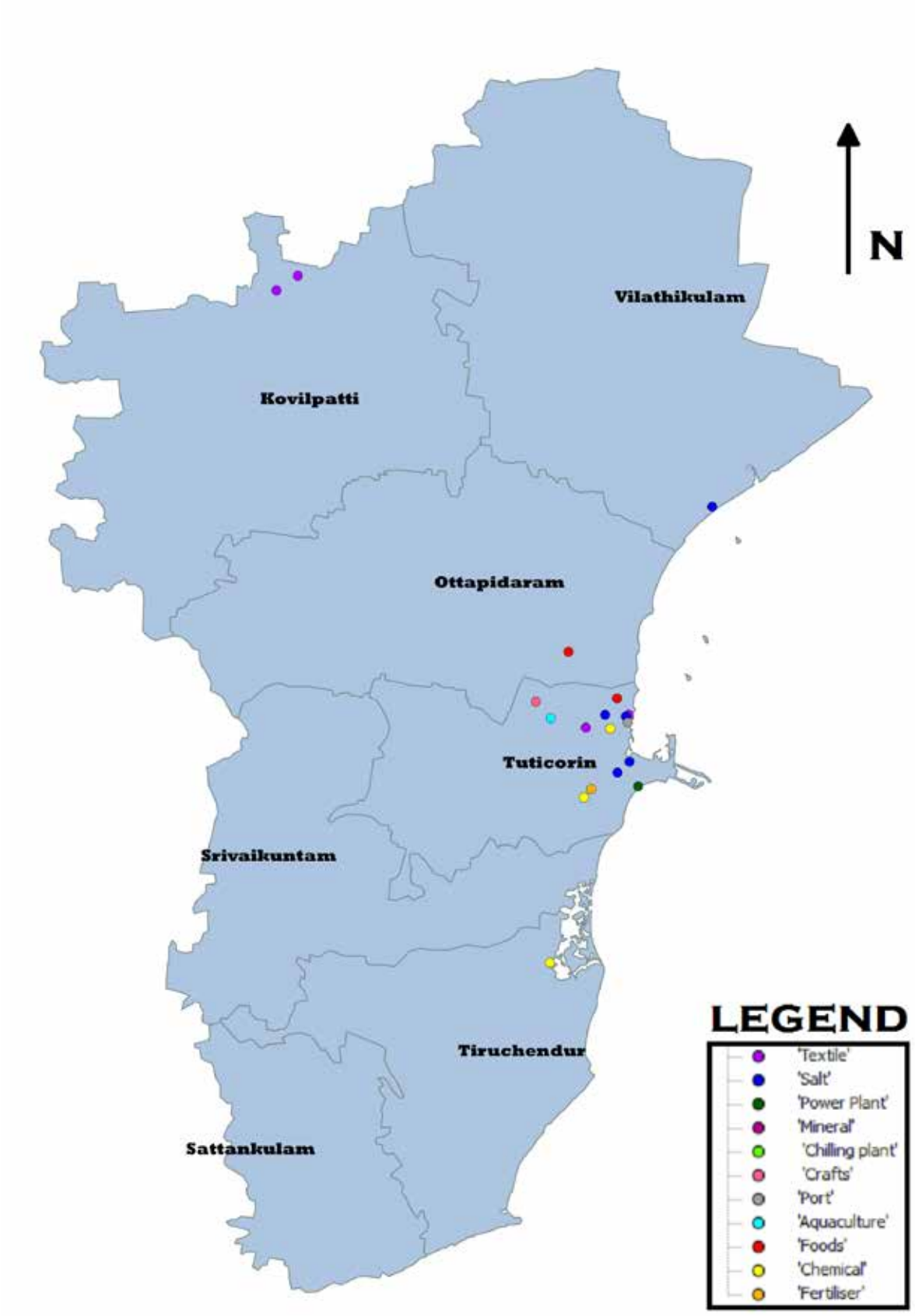

Fig 12: Pre – CRZ 1991 industries
Compiled Industrial data: multiple sources

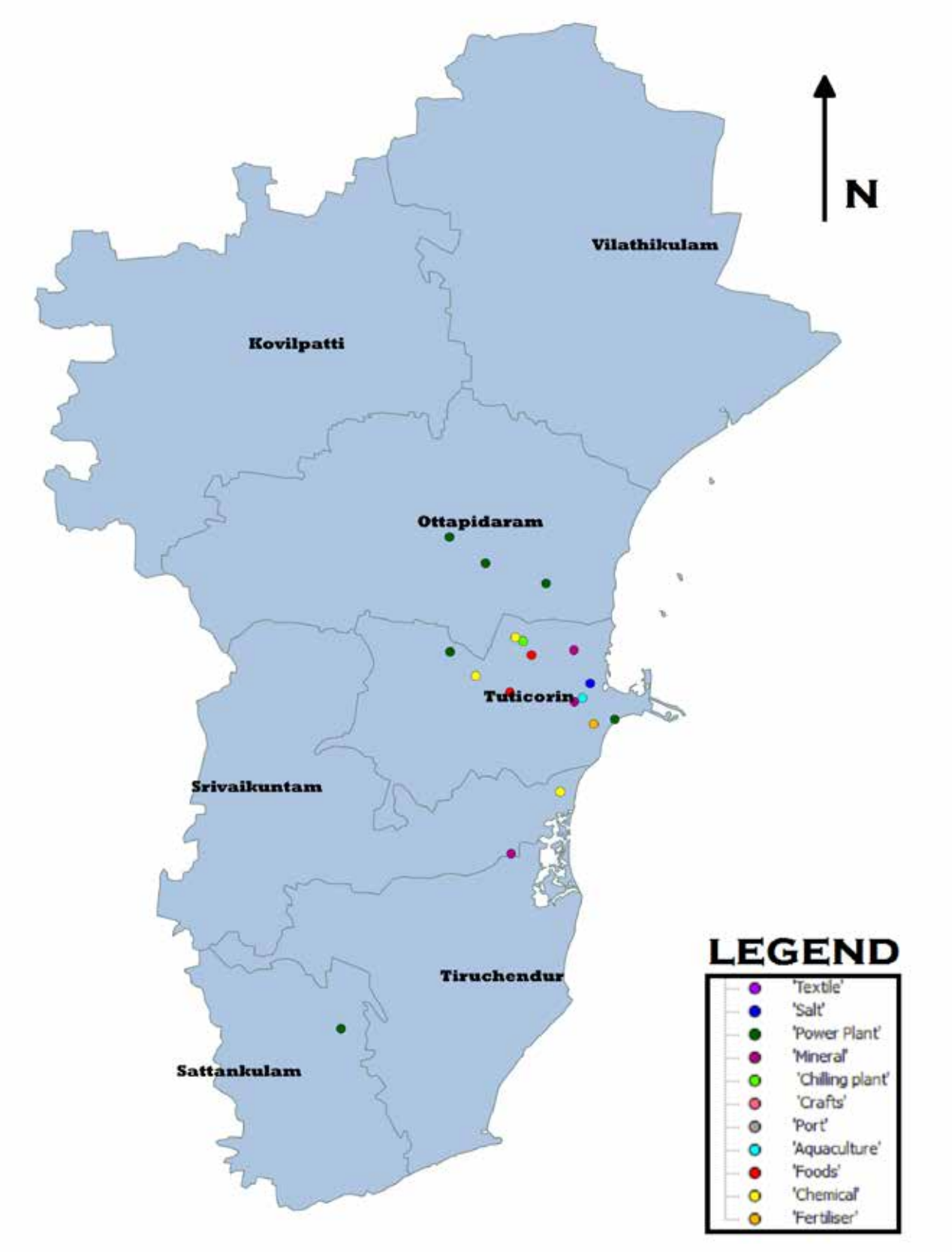

Fig 13: Post CRZ 1991 industries
Compiled Industrial data: multiple sources

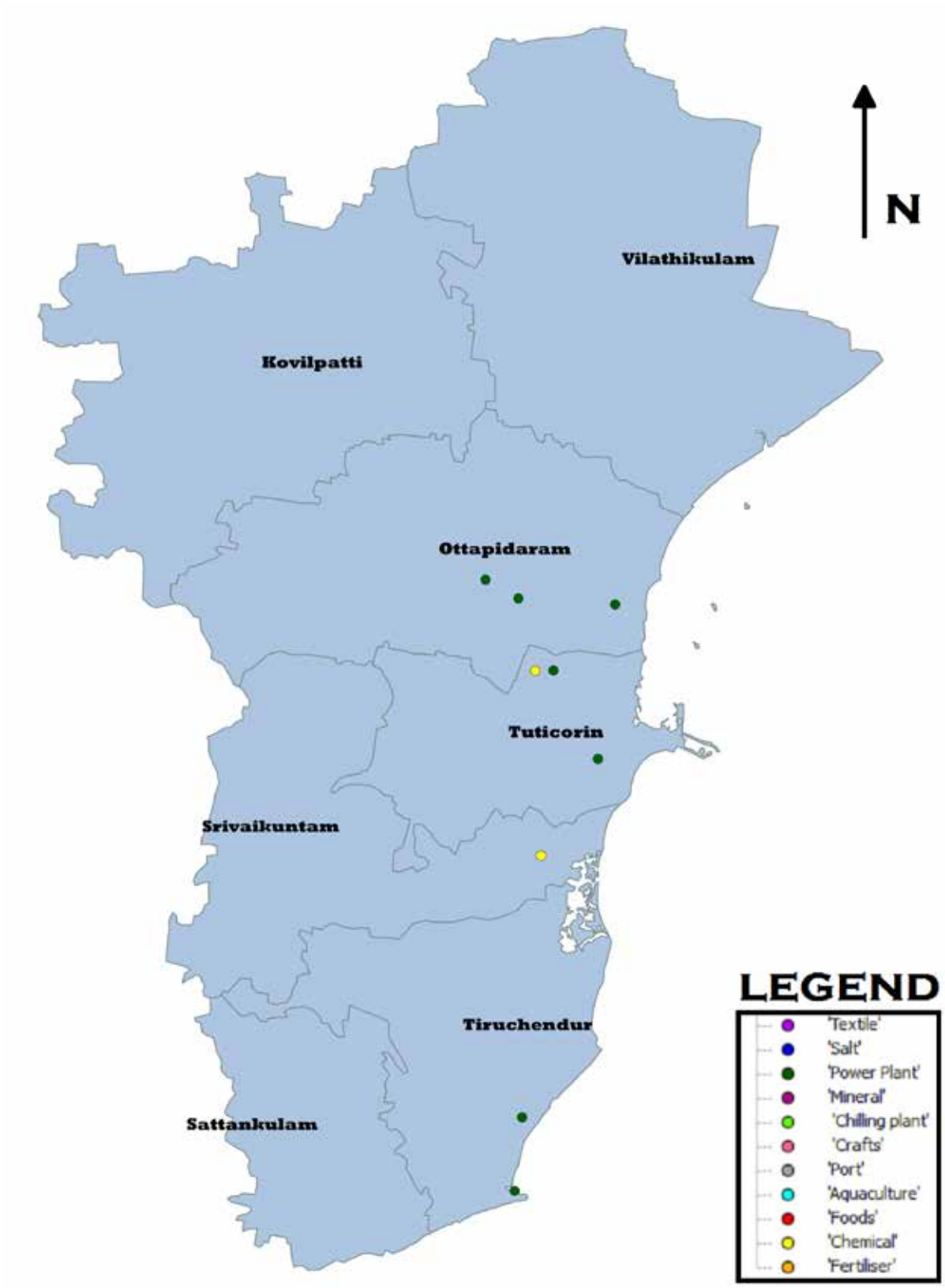

Fig 14: Post CRZ 2011 industries
Compiled Industrial data: multiple sources

Pre CRZ Industries

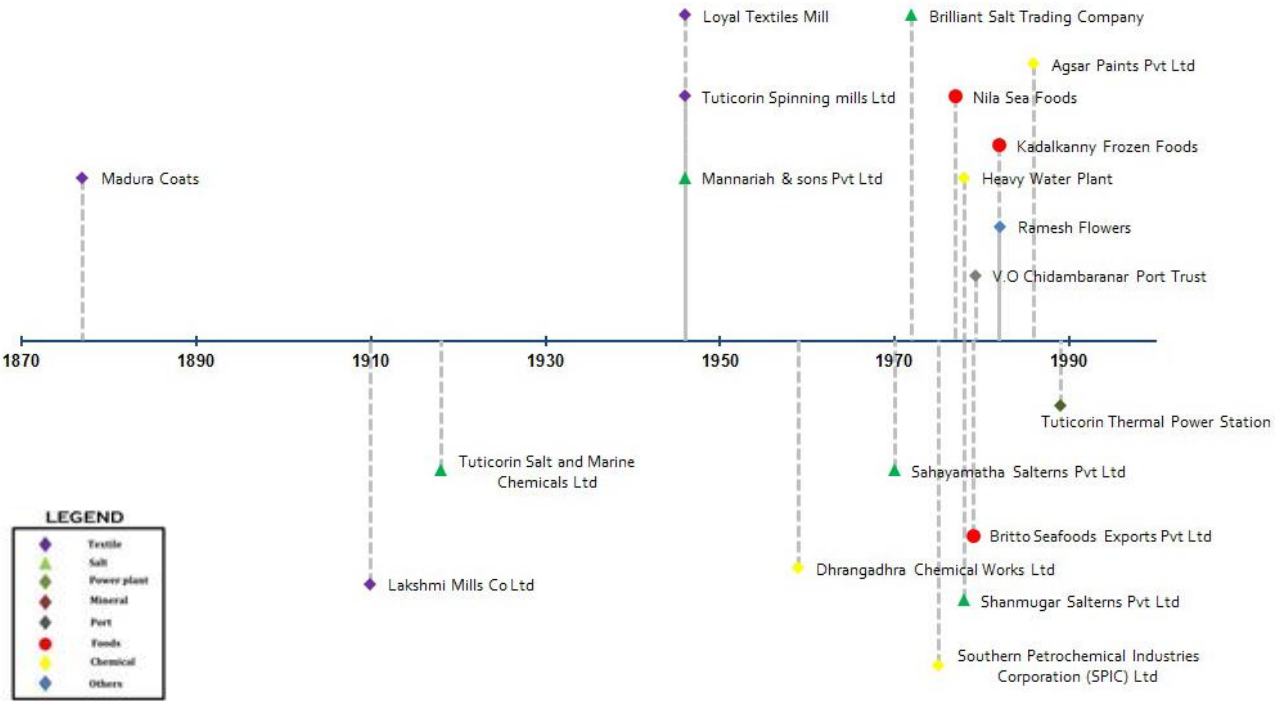

Fig 15: Time line of pre CRZ Industries
Compiled Industrial data: multiple sources

Post CRZ 1991 Industries

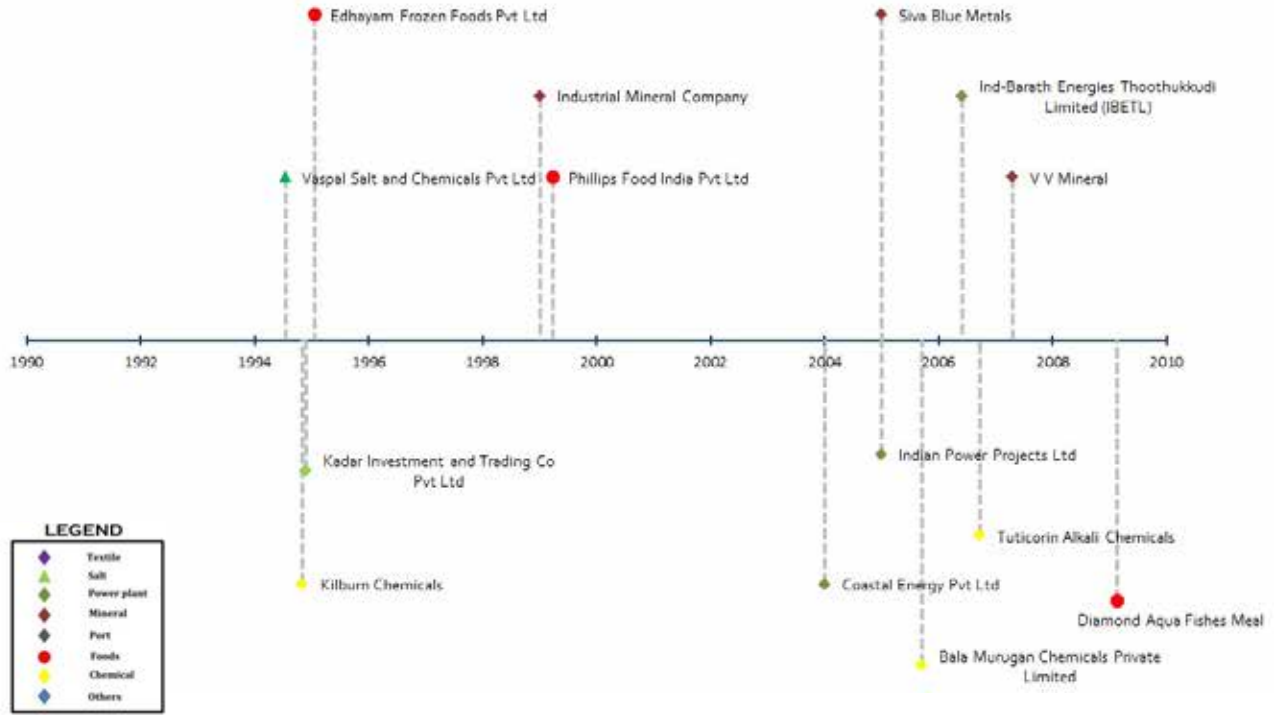

Fig 16: Time line of post CRZ 1991 Industries
Compiled Industrial data: multiple sources

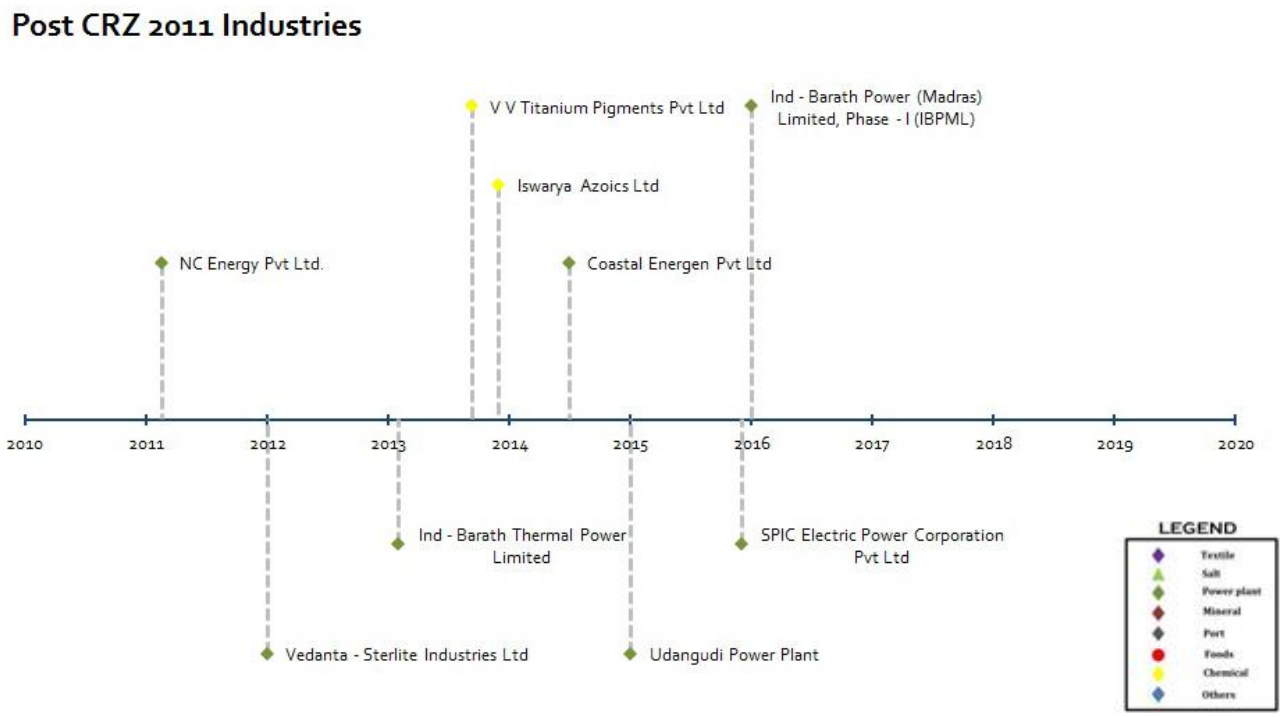

Fig 17: Time line of post CRZ 2011 Industries
Compiled Industrial data: multiple sources

Impact on micro, small and medium enterprises

The micro, medium and small enterprises (MSME) in Thoothukudi also show varying trends; before 1991, the industries indicate a sudden decline in number of units registered per year, employment generated and investment, marked by a leap soon after. Fluctuations over the years indicate that higher investments were channelled into the same number of registered units, with few changes in the employment generation capacity. Between 2004 – 2005, the MSMEs seem to have declined considerably, and are undergoing a slow recovery. Yet the investments post 2008 continue to escalate, in part due to more employment generated perhaps indicating a rise of less mechanised industries, while the number of units registered per year has stagnated.

Changes in land use patterns

Over the last three decades, and aided by the 2004 tsunami, Thoothukudi has seen drastic changes in its land use and land cover patterns. With a settlement pattern changing from a town to an urban city, an increase in salt-affected and industrial coverage at the expense of agricultural land and other coastal habitats, Thoothukudi's landscape seen the forging of several economic opportunities as well as the extinguishing of others over time.

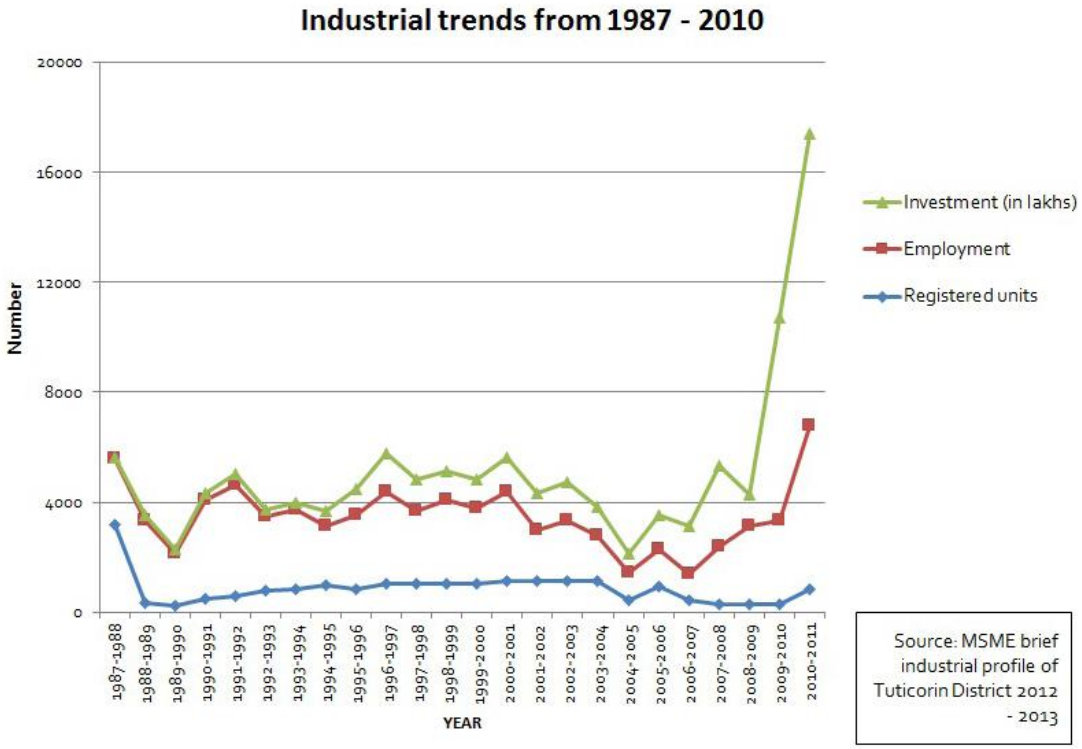

Fig 18: Industrial trends from 1987 - 2010
Source: MSME Brief Industrial Profile of Tuticorin District 2012 - 2013

Between 1993-2001, Thoothukudi's industries saw a 59.20% expansion, a trend that petered out in the following period of 2001-2005, with only 7.57% growth. Urban growth between 1993-2001 was a staggering 45.16%, followed by 0.69% increase in 2001-2005. On the other hand, the mangrove and swamp habitats showed a heartening increase of 49.61% and 74.58% respectively in the 1993-2001 period, and a 20.43% and 33.73% increase respectively in 2001-2005 (Gangai 2010). The trend of settlement and industry indicate difficulties in land acquisition, whereas the increases in mangrove and swamp land point to natural forces of equilibrium at work helped by the prohibition of activities in proximity to and within protected areas. On the agricultural front, the 1993-2001 records changes of -35.79% of cropland, 35.14% in plantations and 92.77% in fallow land, which indicates a drastic change in the agrarian economy, followed by a revival between 2001-2005 of 45.71% cropland, 1.07% plantation and -36.55% fallow land (Gangai 2010).

An analysis of census data collected by the Ministry of Home Affairs, Government of India similarly shows a shift in economy from agriculture to other occupations, including factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, and construction among others, between 1991-2011.

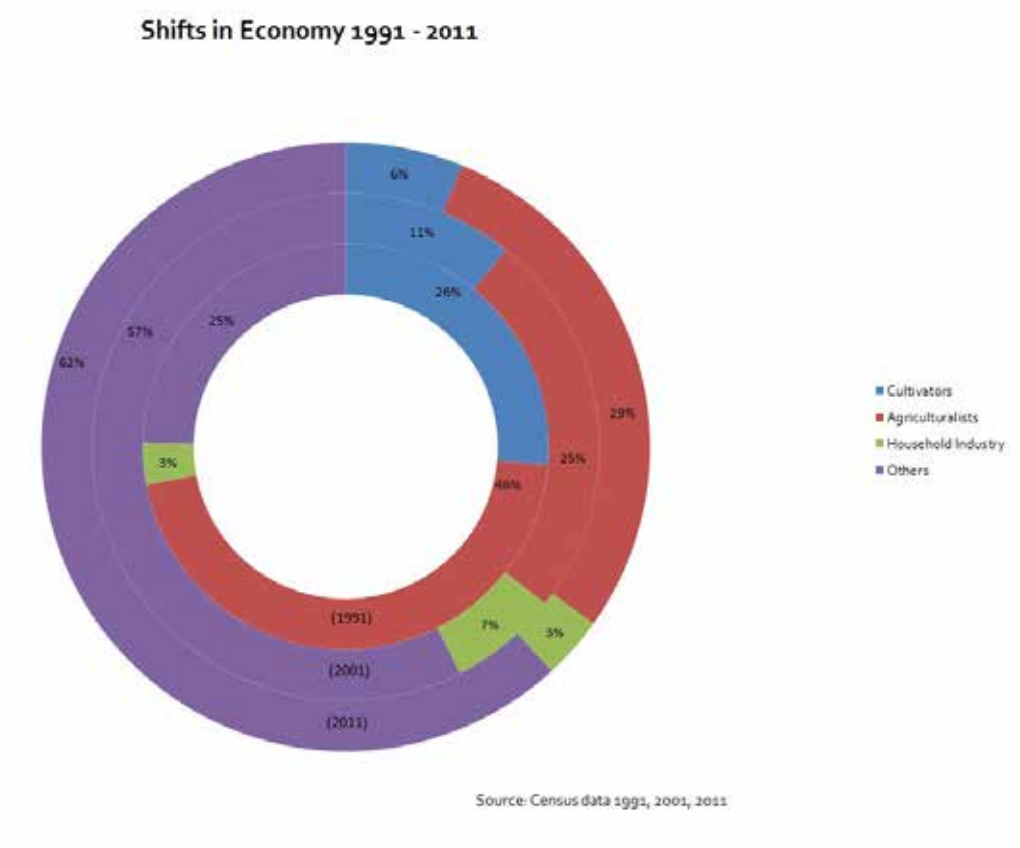

Fig 19: Shifts in Economy 1991 - 2011
Source: Primary Census Abstract, Census data 1991, 2001, 2011

Understanding essential and non-essential activities

The idea of 'integrated coastal zone management' as a means of addressing problems of resource use conflicts and to control the impacts of human intervention in the environment, has been proposed by numerous countries. While ICZM frameworks differ between countries, the ICZM aims to achieve optimum, sustainable use of coastal natural resources, perpetuating biodiversity, conservation of critical habitats etc, while coordinating the initiatives of various economic sectors dependent on the coastlines (Clark 1992). This table shows the multiple uses of the coastal zone that need to be considered while drafting an effective coastal regulation.

In India, following a notification inviting objections against the declaration of coastal stretches as Coastal Regulation Zones (CRZ) and imposing restrictions on industries, operations and processes (published vide S.O.994 (E) on 19 December, 1990), the Coastal Regulation Zone notification of 1991 was issued.

In its initial formulation, the notification embodied an understanding that some activities were unavoidable in coastal areas or for which the coastal areas were essential. These included activities across scales such as local activities of fishers and coastal farmer communities but also commercial large scale activities such as the functioning of the port. Thus the original 1991 notification provided guidelines for developmental activities based on those that required foreshore facilities, and those that are required for local communities, government and industry. Simply put, it made a list of activities that were permitted and some that were prohibited, and also introduced the idea that some areas of the coast were to be divided into regions based on certain features such as ecologically sensitive areas, built up land and rural habitation. Over the years, the list of permitted activities defined as "essential" has expanded with every amendment, culminating in the CRZ notification of 2011, which has had the last word on development along the coast.

Multiple uses of the coastal zone

- Urban settlements
- Industrial development
- Waste disposal
- Shore protection works
- Ports and marine transportation
- Land transportation
- Water control and supply projects
- Sea fisheries
- Aquaculture
- Coastal Forest Industries (mangrove-based)
- Coastal Agricultural (conversion of coastal lowlands for agriculture)
- Extractive industries (sand and mineral mining)
- Tourism
- National security

Sources: Fisheries and Aquaculture Department, United Nations

Yet at no point in time, do either of the notifications or any MoEF documents offer an explanation for why certain activities and development are considered "essential" over others (other than those requiring the foreshore facilities, a term that does not apply to several permitted activities). This chapter tries to explore what is "essential" from the points of view of local communities, government and industry, based on personal interviews from various representatives. Below we present a table that shows the year in which certain activities were added onto the CRZ notification as an essential activity and merited being sited in the narrow CRZ region.

Table 4: Essential activities, as per the CRZ notification

Sector	Activity	Date	Regulation / Amendment Number
Industry	Waterfront activities	19th February, 1991	CRZ 1991
Industry	Atomic Energy Projects	12th April 2001	S.O 329(E) EPA 3(1), 3(2)(v), EP Rules 5(3)(a), 5(4)
Industry	Desalination plants	19th October 2002	S.O 1100 (E) EPA 3(1), 3(2)(v), EP Rules 5(3)& (4)
Industry	Reconstruction, repair works of local communities dwellings	6th January 2011	CRZ 2011
Industry	Storage of non-hazardous cargo within notified ports	19th October 2002	S.O 1100 (E) EPA 3(1), 3(2)(v), EP Rules 5(3)& (4)
Industry	Salt harvesting by solar evaporation	11th January 2002 Draft amendment	S.O 51(E) EPA 3(1), 3(2)(v), 6 EP Rules 5(3)(a),
Industry	Salt manufacture from seawater	6th January 2011	CRZ 2011
Construction and dwelling units	Weather radars & monitoring	19th October 2002	S.O 1100 (E) EPA 3(1), 3(2)(v), EP Rules 5(3)& (4)
Construction and dwelling units	Trans harbour sea links	6th January 2011	CRZ 2011
Construction and dwelling units	Pipelines & transmission lines	12th April 2001	S.O 329(E) EPA 3(1), 3(2)(v), EP Rules 5(3)(a), 5(4)
Construction and dwelling units	Public facilities	19th February, 1991	CRZ 1991
Construction and dwelling units	Existing dwelling units of the traditional coastal communities	6th January 2011	CRZ 2011
Construction and dwelling units	Reconstruction, repair works of authorised dwelling units	6th January 2011	CRZ 2011
Construction and dwelling units	Hotels & beach resorts	19th February, 1991	CRZ 1991
Fish Processing	Hatchery & natural fish drying in permitted areas	19th February, 1991	CRZ 1991
Fish Processing	Facilities required for local fishing communities	6th January 2011	CRZ 2011
Land Reclamation, bunding and alteration	Setting up, construction, modernisation or expansion of foreshore facilities like ports, harbours, jetties, wharves, quays, slipways, bridges	12th April 2001	S.O 329(E) EPA 3(1), 3(2)(v), EP Rules 5(3)(a), 5(4)
Land Reclamation, bunding and alteration	Defence & security purposes	6th January 2011	CRZ 2011

Land Reclamation, bunding and alteration	Controlling erosion	19th February, 1991	CRZ 1991
Land Reclamation, bunding and alteration	Maintenance or clearing of waterways, channels & ports	19th February, 1991	CRZ 1991
Land Reclamation, bunding and alteration	Measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structures for prevention of salinity ingress & freshwater recharge	19th February, 1991	CRZ 1991
Waste Management	Facilities required for discharging treated effluents	19th February, 1991	CRZ 1991
Waste Management	Storm water drains and ancillary structures for pumping	19th February, 1991	CRZ 1991
Waste Management	Facilities required for treatment of waste and effluents	24th June 2003	S.O.725(E) EPA 3(1), 3(2)(v) EP Rules 5(3), 5(4)
Waste Management	Drainage and sewerage facilities in areas between LTL and HTL of CRZ 1	19th February, 1991	CRZ 1991
Waste Management	Construction of units and auxiliaries for domestic sewage, treatment and disposal	6th January 2011	CRZ 2011
Oil and Hazardous substances	Transfer of hazardous substances from ships to ports, terminals & refineries & vice versa	19th February, 1991	CRZ 1991
Oil and Hazardous substances	Facilities for receipt & storage of petroleum products & liquefied natural gas	19th February, 1991	CRZ 1991
Oil and Hazardous substances	Regasification of liquefied natural gas in areas not classified as sea grass beds	4th August 2000	S.O 730 (E) EPA 3(1), 3(2)(v), 6
Oil and Hazardous substances	Facilities for receipt & storage of fertilisers & raw materials required for their manufacture between LTL and HTL which are not ecologically sensitive	6th January 2011	CRZ 2011
Mining	Those rare minerals not available outside this CRZ area	19th February, 1991	CRZ 1991
Mining	Exploration & extraction of natural gas in areas between LTL & HTL which are not ecologically sensitive	16th January 2003	S.O 52 (E) EPA 3(1), 3(2)(v) EP Rules 5(3), 5(4)
Mining	Exploration and exploitation of Oil and Natural Gas	12th April 2001	S.O 329(E) EPA 3(1), 3(2)(v), EP Rules 5(3)(a), 5(4)
Groundwater withdrawal	In areas which are inhabited by local communities & only for their use	31ST January 1997	S.O.73(E) EPA 3(1), 3(2)(v), EP Rules5 (3)(a), 5(4)
Groundwater withdrawal	In areas where no other source of water is available & done manually through ordinary wells for drinking, horticulture, agriculture & fisheries	19th February, 1991	CRZ 1991
Ports and Harbour	Those projects classified as strategic & defence related	6th January, 2011	CRZ 2011

Other perspectives on essential coastal activities

The CRZ demarcation of the coastal areas into regulation zones reveals a tension between competing drivers of regulatory mechanisms. Regulatory clauses were introduced or removed depending on certain aspects such as geomorphology, coastal vulnerability, existing degree of development and future development concerns. The demarcation also represents the interests of different factions: local communities and settlements, government and industry. Such diverse interests are not always compatible with each other, yet are important considerations for policy makers, and regulations could be more easily accepted and implemented, if they have undergone a healthy process of public participation.

Local communities and settlements

Coastal communities, particularly the numerous fishing caste groups located along the Thoothukudi coast have depended on a range of natural resources available in this region, including in the rich waters of the Gulf of Mannar. A range of fishing practices and technologies have been developed in this region, which are intimately shaped by the environment of the region. In Thoothukudi, the pearl and chank industry thrived on the efforts of the fishing community, as do fisheries today, and their claim to the coast is in part at least predicated on their age old practice.

However, fishing practices have transformed over time. At present, from the perspective of fishers, essential activities would include those that help them economically in setting up fishery-related facilities for fish-drying, net-mending, post-harvest processing and storage, as also those that establish their socio-political rights over the coastal stretches such as rights to livelihood, access to water, other natural resources and public utilities of health, sanitation and education. The community's major dissension to industry emerged from its impacts on their livelihood. With the threat of pollution, dwindling fish-stocks, increased costs of operation, and rising health problems, their concerns are well-founded. Fishers stated that among the essential activities on the coast, should also be facilities for better industrial waste management.

State supported development

The government's stake in development along the coast lies appears to be with a view to maximising revenue potential, facilitating a particular form of development and in facilitating its interests in defence and security related establishments. All these activities such as industrial development, security or defence need a more critical examination of their putative benefits. The government also takes certain actions in the direction of making available energy, water and land requirements presumably for both the community and industry. In Thoothukudi, the government has supported several industries over the years, reflecting its changing notion of what is 'essential' industry for the region over time. Numerous rural development projects including efforts to promote fisheries and salt works through subsidies and other indirect support is seen in the activities in Thoothukudi. In recent years, more subsidies and land are being allocated to technology-based industries, with the port and the power sector as priority. The government officials we spoke to consider fisheries and related activities, port expansion and facilities within industries for self-sufficiency, such as power and desalination plants as essential for future development (Kumar pers.comm.2014)

Industry

Even with industries in Thoothukudi changing over time to avail of different economic opportunities, some of our informants reported stagnation in several sectors. They cited difficulty in land allocation, increased conflict with the urban populace over resource-utilisation, inadequate transport infrastructure, more stringent regulations for development, health and safety, a dwindling labour force, and a vicious circle of corrupt politics as having contributed to 'industrial problems'.

Industry representatives in turn are divided in their opinions on what is essential to their development. Salt and allied industries would benefit from a change in the political environment; with easier land acquisition and lesser corruption. The textile, chemical and power industries, as an import-export based sector is in favour of the upgradation of the port infrastructure; conveyor belts for coal transport, dredging of the port for deepening the draught, and more captive jetties. This pilot did not access the views of the tourism sector although its importance in the coming years is likely to grow and does merit future enquiry.

Concluding remarks

Our preliminary findings show that while the revised CRZ notification of 2011 has demarcated zones for development and regulates certain industries along the coast, these regulatory clauses although normative, tend to privilege particular pro-industry interpretations and values in their actual implementation. To elaborate, the idea of what constitutes essential activities permitted in coasts under the CRZ do not explicitly resonate with what other actors believe are essential activities in coastal areas. However we find that by not including a number of these activities or clear ways of regulating them within its ambit, the CRZ Notification permits arbitrary activities to take place around its list of permitted activities.

A look at the numerous amendments that have introduced newer forms of industry in coastal areas as essential activities or meriting permission in coastal areas is indicative of this trait.

In future, we wish to investigate in greater detail how certain arguments for "essential" and "non-essential" activities make their way into the text of the law and also what implications this legal term has for local residents of Thoothukudi (such as fishing communities and urban dwellers), industrial establishments and local government departments.

The CRZ 1991 was framed using the provisions of the Environment (Protection) Act, 1986, and was intended to regulate and restrict anthropogenic activities to protect and improve the quality of the coastal stretches. Understandably, a general, all-encompassing law for a 7,500 kilometre coastline, which represents diverse environments, both natural and social, would have its lacunae.

The idea of "essential" activities emerged when coastal regulations were stretched to allow constructions that did not strictly need the foreshore, and could easily be located further inland. The need to define functional coastal activities, those that would fulfil their purpose only with access to the foreshore, resulted in the list of exceptions within the CRZ 1991 and 2011. As with all laws, a certain degree of flexibility was needed so that a case-to-case based consideration is possible, and contextual interpretations can be drawn. However, if this flexibility is interpreted as ambiguity, or creates lacunae for the changing agendas of different interest groups, which do not strictly comply with the sense of the law, the regulations are perceived as faulty.

Despite regulations, industrial development is not confined to "essential" activities, as Thoothukudi's context demonstrates. Industrial growth is not limited by geographic, economic or political factors, and represents an interplay between all of these. Various disciplinary perspectives and actors profess their own criteria for defining "essential"; ecologists would consider coastal biological and geomorphological features and processes as paramount, economists would prioritise industrial development, and so on. While it is not possible to identify a single set of objective criteria that would meet varying disciplinary and interest group ideas of essential activities or even the idea of development, this pilot has certainly shown the tensions within the CRZ law in trying to address these, at times privileging certain actors and interest groups.

We also see that industries work in synergy, the establishment of one industry often encourages other ancillary development. This mushrooming of allied or dependent industries is a phenomenon that deserves closer attention. Industries change over time, as different geographic and economic opportunities are exploited, and governments need to align their development policies to these dynamic industrial trends. As the scope for expansion is limited by the availability of land, transport infrastructure, labour, power and water supply, the politico-legal environment plays a significant role in shaping this growth.

Admittedly, the CRZ notification of 2011 has its shortcomings and does not address the complex issues of coastal spaces, However, it cannot be discredited altogether as it still recognises the threats of coastal development and contains vital safeguards for such activities. Only by putting a law into practice, can we further identify the problems that could emerge in interpreting and implementing certain clauses, and how they need to evolve over time to better represent the needs of everyone involved, particularly those of marginalised groups.

References

ADB (Asian Development Bank), UN (United Nations) and World Bank. 2005. India, Post-Tsunami Recovery Program; Preliminary Damage and Needs Assessment, New Delhi.

Anon. 2012. Many small scale industries on the verge of closure owing to outage. The Hindu. http://www.thehindu.com/todays-paper/tp-national/tp-tamilnadu/many-small-scale-industries-on-the-verge-of-closure-owing-to-outage/article2972499.ece. Accessed December 02, 2014.

Anon. 2012. VOC port acts as catalyst for economic growth of Tuticorin. The Hindu. 19 October. http://www.thehindu.com/todays-paper/tp-national/tp-tamilnadu/voc-port-acts-as-catalyst-for-economic-growth-of-tuticorin/article4011945.ece. Accessed January 21, 2015.

Anon. 2013. Demand to modernise Tuticorin airport. The Hindu. http://www.thehindu.com/todays-paper/tp-national/tp-tamilnadu/demand-to-modernise-tuticorin-airport/article4744904.ece Accessed December 02, 2014.

Anon. 2013. Tuticorin Alkali stops production on raw material concerns. Business Standard. http://www.business-standard.com/article/companies/tuticorin-alkali-stops-production-on-raw-material-cash-concerns-113070201148_1.html. Accessed December 02, 2014.

Anon. The Hindu. 20 August, 2012. Tuticorin residents reel under severe drinking water crisis. http://www.tniusnews.org/index.php?option=com_content&view=article&id=21034:tuticorin-residents-reel-under-severe-drinking-water-crisis&catid=56:Water%20Supply%20&Itemid=90. Accessed on March 01, 2015

Arunachalam, B., Sukumar, B., Sukumar, A. 2006. Reconstruction of the ancient port, Korkai in Tuttukkudi district of Tamil Nadu. Current Science, Vol 91, No 3, Pp. 278.

Asha, P., Diwakar, K. 2013. Coastal water deterioration and associated fish mortality due to effluent discharge from a fish meal factory at Pattanamaruthor coast, north of Tuticorin. Marine Fisheries Information Service; Technical and Extension Series (215), Pp 13-14.

Bansal, U., Bansal, B. 1984. Industries in India during the 18th and 19th Century. Indian Journal of History of Science, 19 (3). Pp. 215–223

Bhalla, R., Ram, S., Srinivas, V. 2008. Studies on Vulnerability and Habitat restoration along the Coromandel Coast. FERAL.

Chaturvedi, S. 2013. Now, Illegal beach sand mining in TN. The Statesman.

Chelladurai, S., C, C., P, A., and K, T. (2014). Groundwater contamination due to salt-panning activity and seawater intrusion at Tuticorin coastal zone, southern Tamil Nadu, India. International Journal of Advanced Geosciences, 2(2), Pp. 133—139. http://dx.doi.org/10.14419/ijag.v2i2.3501. Accessed on February 28, 2015.

CMFRI (Central Marine Fisheries Research Institute). 2005. Marine Fisheries Census 2005.

CMFRI (Central Marine Fisheries Research Institute). 2012-2013. CMFRI Annual Report.

Coal Swarm, Centre for Media and Democracy. No date. Source Watch. http://www.sourcewatch.org/index.php/Tamil_Nadu_and_coal. Accessed January 23, 2015.

Clark, J. 1992. Integrated management of coastal zones. FAO (Food and Agriculture Organization). Pp. 4.

Dharmadhikary, S. 2014. India Together. http://indiatogether.org/water-concerns-near-coastal-thermal-power-plant-krishnapattanam-cheyyur-environment. Accessed January 22, 2015.

District Collectorate. n.d. National Informatics Centre. http://thoothukudi.nic.in/profile.html. Accessed January 21, 2015.

Gangai I., Ramachandran, S. 2010. The role of spatial planning in coastal management - A case study of Tuticorin coast (India). Elsevier. Pp. 518—534.

http://timesofindia.indiatimes.com/city/madurai/Illegal-beach-sand-mining-issue-to-be-taken-up-in-Supreme-Court/articleshow/22529486.cms. Accessed December 02, 2014.

http://www.business-standard.com/article/sme/rough-times-for-tuticorin-salt-units-as-exports-fall-113040100486_1.html. Accessed February 28, 2015.

http://www.ndtv.com/article/south/years-of-illegal-sand-mining-take-its-toll-on-tuticorin-coast-shore-line-eroding-404453. Accessed December 02, 2014.

http://www.thestatesman.net/news/10233-now-illegal-beach-sand-mining-in-tn.html. Accessed December 02, 2014.

ICC (Indian Chamber of Commerce). 2012. The Indian Coal Sector: Challenges and future outlook. PricewaterhouseCoopers India.

Joshi, P. 2014. Salt Production dips in Tuticorin. The Hindu. http://www.thehindu.com/news/cities/Madurai/salt-production-dips-in-tuticorin/article5745809.ece. Accessed December 02, 2014.

Koshy, S. 2012. Years of illegal sand mining take its toll on Tuticorin coast, shore line eroding. NDTV.

Madan, M., Ranjit, L., Radhakrishna, K., Kandan, K., Aswathy, N. 2013. Harbour Based Fisheries Management in Thoothukudi District - A Case of Thoothukudi Fishing Harbour. Central Marine Fisheries Research Institute. Pp. 361.

Madras Consultancy Group. 2008. Thoothukudi Vision -2025. CII (Confederation of Indian Industry).

Mellinger, A, Sachs, J, Gallup, J. 2000. Climate, Coastal Proximity and Development. In Oxford Handbook of Economic Geography, by Meric S. Gertler, Maryann P. Feldman Gordon L. Clark, Pp. 169—194. Oxford University Press.

Ministry of Environment and Forests (MoEF), 2013. x800 MW Udangadi Super Critical Imported Coal Based TPP at village Udangudi, in Thiruchendur Taluk, in Thoothukudi district, in Tamil Nadu - reg. Environmental Clearance. Dated: October 14th, 2013. http://environmentclearance.nic.in/writereaddata/Form-1A/EC/101520131ECUdangadi.pdf. Accessed March 11, 2015.

Ministry of MSME (Micro, Small and Medium Enterprises), 2013. A Brief Industrial Profile of Tuticorin District 2012 - 2013.

Mondal N., Singh, V., Rangarajan, R. 2008. Aquifer characteristics and its modeling around an industrial complex, Tuticorin, Tamil Nadu, India: A case study. Journal of Earth System Science, Indian Academy of Sciences.
Narasimhan, T. 2013. Rough times for Tuticorin salt units as exports fall. The Business Standard.

Sangeetha, K., Vijayakumar, S., and Srinivasan, S. 2013. Economic Times. VV Minerals chairman Vaikundarajan under scanner for illegal mining to the tune of Rs 96k crore. http://articles.economictimes.indiatimes.com/2013-09-14/news/42062340_1_illegal-mining-mining-baron-beach-sand. Accessed December 02, 2014.

Sankar, U. 1998. Laws and institutions relating to environmental protection in India. Occasional Paper, Madras School of Economics, Chennai. http://www.mse.ac.in/pub/opsankar.pdf. Accessed 01 March, 2015.

Selvam, S., Ravindaran, A., Rajamanickam, M., Sridharan, M. 2014. Microbial contamination in the sediments and groundwater of Tuticorin Corporation, South India using GIS. International Journal of Pharmacy and Pharmaceutical Sciences, Vol 6, Issue 4.

Swaminathan, M. S. 2014. Sea water as a social resource: significance of Vedaranyam March. The Hindu. www.thehindu.com/news/national/sea-water-as-a-social-resource-significance-of-vedaranyam-salt-march/article979463.ece. Accessed March 12, 2015

TERI (Tata Energy Research Institute). 2002. Coastal tourism, environment and sustainable local development. Pp. 1.

The Gazette of India. 2000. Part III, Section 4. Tariff Authority. http://www.tariffauthority.gov.in/htmldocs/orders/tpt_0021_pg1.htm. Accessed November 19, 2014.

TNN (Times News Network). 2013. Illegal beach sand mining issue to be taken up in Supreme Court. Times of India.

VOC (V.O.Chidambaranar Port Trust). 2014a. http://www.vocport.gov.in/port/userinterface/statisticals.aspx. Accessed January 21, 2015.

VOC (V.O.Chidambaranar Port Trust). 2014b. http://www.vocport.gov.in/future_plan.aspx. Accessed December 15, 2014.

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